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AVIATION AND AIRCRAFT JOURNAL

Forest Fire Photographed from an Army Airplane

Photo U. S. Army Air Service

VOLUME X
Number 19

SPECIAL FEATURES

PARAGRAPH 13, N.A.C.A. REPORT TO PRESIDENT
WHAT THE WEATHER BUREAU DOES FOR AIR PILOTS
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WHO'S WHO IN AMERICAN AERONAUTICS
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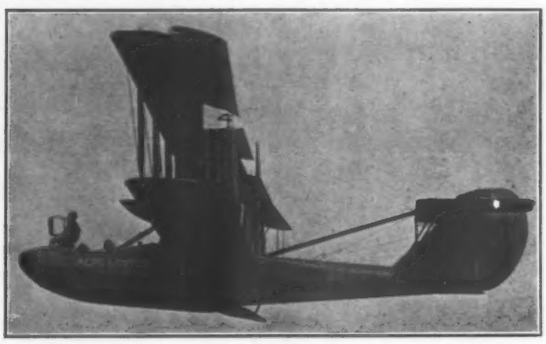

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MAY 9, 1921 VOL. X. NO. 19

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INDEX TO CONTENTS

Editorials	587	Gordon Bennett Balloon Race	599
Paragraph 13 Left Out	588	British Air Power and Air Policy	600
State and Local Air Laws and Ordinances	591	Reversib'e Steel Propeller Successful	604
Entries for National Balloon Race	592	A Letter	604
"Who's Who in American Aeronautics"	593	Airplane Crashes—Engine Troubles	605
What the Weather Bureau Does for Air Pilots	595	Book Reviews	606
New Chain of Landing Fields	597	The Washington-St. Thomas Flight	607
The Vickers Viking IV Amphibian	597	Test of 700 hp. Model W. Engine	607
How U. S. Can Save $452,000,000	598	Lloyd's Aviation Record	607
Fire at Wittemann Plant	599	Municipal Air Port at Hartford, Conn.	608

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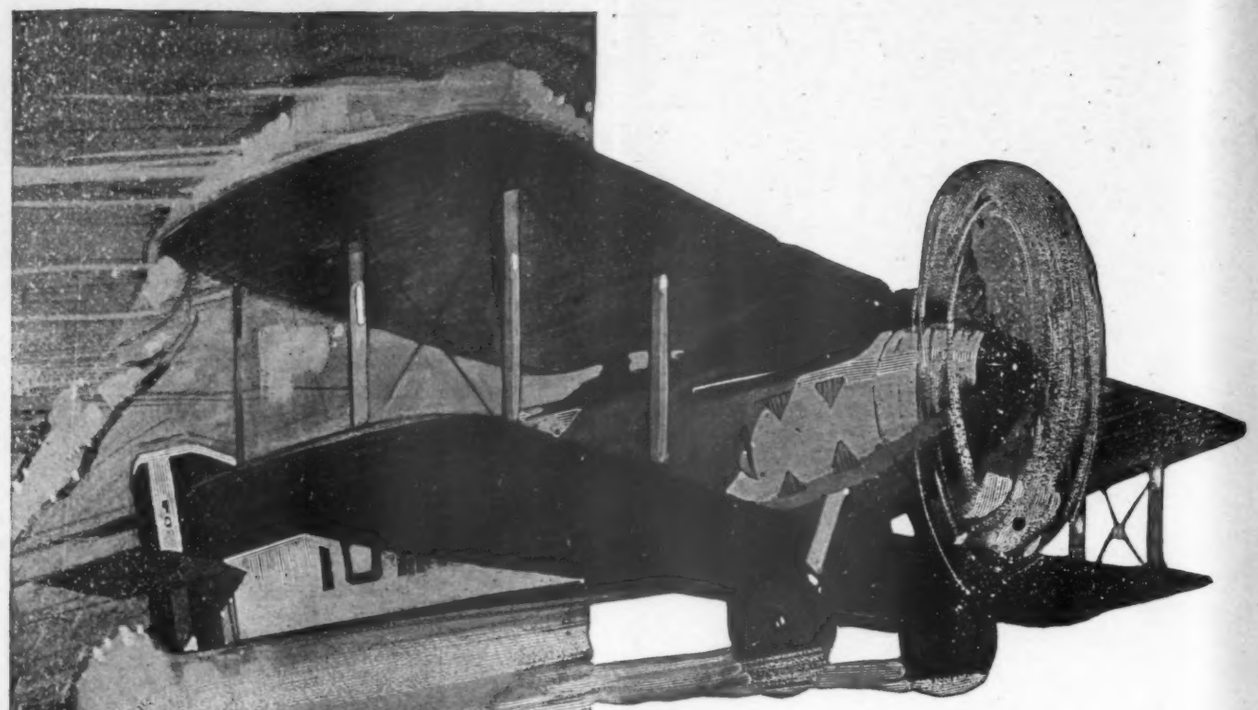

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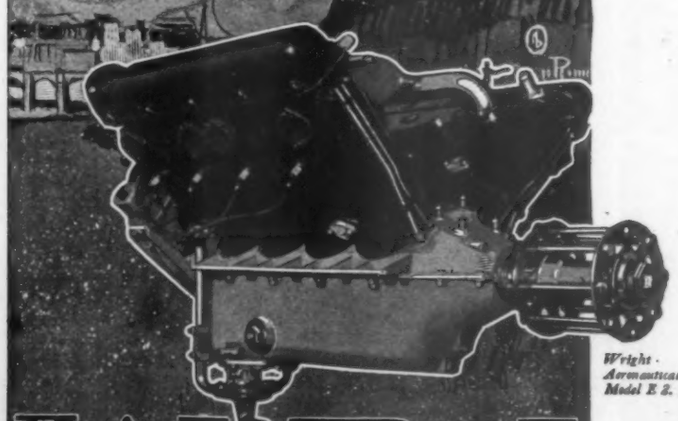

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Reduction of Insurance Rates

ONE of the most important factors in the advancement of commercial aeronautics is the question of insurance rates. In no aeronautical business, whether it be a flying school, air transportation, aerial photography or air taxi work, can insurance be dispensed with for any length of time. Nor can capital be induced to finance aerial enterprises on a large scale, until the question of insurance is satisfactorily settled.

At present the insurance companies are actually raising their rates, arguing that they have lost money in the business. This raising of rates causes dissatisfaction all round, and hampers development generally. On business principles, the insurance companies are of course quite right; their premiums should be such as to leave a reasonable profit, and they cannot be expected to contribute charitably to the aeronautical industry. But is it not possible that a better solution would be not an indiscriminate raising of rates, but a more careful study of each insurance policy written. Certainly, if a pilot uses for pleasure rides a single machine which is besides carelessly rebuilt, if the airdrome is poor, if the mechanics' skill is small, if the territory surrounding the field is poor, the risk is high and the insurance rate should be high accordingly. On the other hand, where a first-class machine, with perfect air and ground personnel is operated by a reputable company, much more reasonable rates should be obtainable than are now charged.

Local Air Legislation

THE various laws dealing with air navigation which are in force in several states of the Union as well as sundry city ordinances concerning the same subject—which are reproduced in this issue—make interesting reading and are likely to be a revelation to many a pilot.

As might be expected, the American air regulation which is oldest in date of issue, that of the town of Kissimmee, Fla., contains by far the quaintest provisions a pilot has ever been expected to fulfill. The flying machine or lighter-than-air craft which comes within the jurisdiction of that town is supposed to be fitted with "bells, whistles or horns, brakes, lights and other signalling and controlling apparatus and nets, parachutes, flying belts and artificial wings"—not to speak of "other safety apparatus" which the government may provide for. What the ordinance fails to specify, is the nature of these "flying belts and artificial wings". All aircraft—which the ordinance terms "airships"—are subject to an annual license tax which works on a sliding scale from ornithopers and helicopters down to "powerless" and stationary balloons, whatever the latter may mean, and an additional tax must be paid for each flying field. These taxes are so high that it is extremely improbable that any aviation enterprise would ever select the town of Kissimmee for its place of business. A particularly thoughtful provision of this ordinance is that which makes it unlawful to collide with telegraph and telephone poles, it being obviously the assumption that aviators delight in that sort of acrobatics.

While the Kissimmee ordinance probably represents the extreme in this line of endeavor, there are other local air laws and ordinances which contain peculiar features. For instance, a parachute descent within the limits of Nutley, N. J., calls for a fine of $25 for the first offense and for thirty days imprisonment for every successive violation. In the Territory of Hawaii and in the city of Newark, N. J., operators of aircraft must have a license issued by the federal government, which comes to say that, as the government does not issue certificates to civilian pilots, the latter cannot legally fly in Hawaii or in Newark.

The above samples fittingly illustrate the great need for a prompt enactment of federal air legislation, as urged by President Harding in his address to Congress.

Federal regulation of air navigation alone can provide for the uniform licensing of pilots and the issue of airworthiness certificates to commercial aircraft throughout the country. At the same time it will have to work out the ground organization required by commercial aviation. By providing competent pilots, safe aircraft and the necessary ground organzation, federal air legislation will hasten the development of commercial aviation.

"A Logy Machine"

ONE of the loosest, yet most commonly used expressions in aviation is the phrase "a logy machine". If a pilot states that a machine is logy, it is thereby damned. And the impression has been applied to large and small machines of every type.

It would seem useful to analyze what is precisely in the pilot's mind, when he makes an unfavorable comment of this kind. He may mean that the machine is slow to respond to control. What an unsatisfactory way of setting out this fact! It would be much better to say, that the machine is slow to take up a bank or to head down, or anything else in the way of a maneuver. Or he may mean that the machine has little reserve power.

Suppose a machine is flying at an angle of incidence of 6 deg., cruising speed and a downward gust hits it. The effective angle of incidence is thereby diminished and the machine has a tendency to drop, unless there is reserve power, so that the speed can be immediately increased. A highly powered machine will thus meet the gust without any difficulty. A "logy" machine may have a great deal of power, and yet a small reserve relative to the weight and structural resistance of the plane.

If pilots would drop the term "logy" and particularize their statements and experiences, the designer would be greatly benefitted, and the particular airplane under consideration would receive a fairer judgment.

"Paragraph 13" Left Out

Minority Views Outvoted in Writing N.A.C.A. Report to President Harding

The various telegrams and letters printed in the last issue of AVIATION AND AIRCRAFT JOURNAL regarding the overruling of the minority of the subcommittee of the National Advisory Committee in making its report to the President have brought to the attention of those interested in aviation a situation that evidently requires a great deal of explaining. There is printed herewith a letter from Glenn L. Martin giving his understanding of what happened at the meetings of the Committee. Frank H. Russell who was also a member of the committee confirms Mr. Martin's statements. Dr. C. D. Walcott, Chairman of the Committee, has made a statement which is also printed, as it shows that there was a strong minority view expressed.

The whole controversy is centered over the inclusion of an additional or Thirteenth paragraph to the Report to the President. This paragraph that the minority desired included was to the effect that nothing in the report was to prevent the consideration of a Unified Air Service later. The two members of the minority Major Walter Kilner and Col. Sidney Waldon were outvoted in their desire to have Paragraph 13 included as Dr. Walcott states, and as both Mr. Martin and Mr. Russell had left the city with the impression it was to be included, the President was not given the views of the civilian members of the Committee except in the form of a letter which went to him later in a memorandum. As this was sent to the President with a separate letter, it is hoped that the letter transmitting it may be made public so that it will be known why the minority views were not transmitted by him to Congress as a part of the report. Colonel Waldon stated in a telegram printed last week that "Both reports were forwarded to the President and together represent the complete recommendation of the Committee".

The hope is generally expressed that the President will appoint a committee of civilians who know about the needs of the country in aviation and that in selecting the membership he will be guided by the fact that it is only natural that officials in existing departments will not as a rule recommend the unification of governmental aviation. There follow the letters mentioned above.

Statement of Glenn L. Martin

"In answer to your telegram requesting 'information on the action of the National Advisory Sub-committee for Aeronautics, with particular reference to the discussion of a Department of the Air or an Air Force, and for the opinion and actions of the minority group in the matter, in the Sub-committee meeting'; I would like to state briefly as follows:

"In looking over my correspondence, I feel that the minutes of the National Advisory Sub-Committee are released, for, in answer to my request for a copy of the minutes and report, I received a communication from the National Advisory Committee, in part as follows:

> 'Although the remarks on aviation in the President's message may be considered an approval of the Committee's report, the report as a whole has not been released. Under the custom governing such matters in Washington, the report remains the exclusive property of the President until released. I will send you a copy just as soon as it is permisible to do so.'

"Since this letter I have received a copy of the minutes of the meetings of the National Advisory Sub-Committee, and now assume that they are released for the consideration of those interested in the subject.

"I shall make no comment on the minutes of the meetings, but perhaps the following statement will answer the questions you have in mind.

"The President's letter asked the sub-committee to take up vigorously and fully three definite things, with two sets of answers to each; what could and should be done immediately without further legislative action, and what were the recommendations of the sub-committee with legislative action, and the amount of appropriation recommended for each of the three, to carry out the sub-committee's recommendations.

"Before taking up the definite questions asked, the majority considered it advisable to agree on the general principles of a national aviation policy before proceeding with the definite answers required. There were copies distributed of a memorandum entitled 'General Considerations on a National Aviation Policy', and during the discussion the subject of an Air Force and its advantages was brought up for discussion, and it was considered by the majority present that the discussion of the workings of an Air Force should not properly come before this committee under the instructions in the President's letter. The entire committee then proceeded with the discussion of the various paragraphs under the general policy to be agreed upon.

"The subject of an Air Force was again brought up in the Thursday morning session by Mr. Waldon who stated that he felt it of importance that a Department of the Air be considered in the report to the President.

"I am unable to repeat from memory, word for word, on the discussion, but, briefly, the opposition was to the effect that they did not believe any mention of a United Air Service, Air Force, or Department of the Air should be made. I followed with the statement that I considered it of great importance that the Sub-committee make reference to the possible future consideration of an Air Force and that I, for one, did not want to have the President believe that we had done the best we could under the instructions—to 'take up vigorously and fully, cooperation among the various departments of the government concerned with aviation', without making reference to a Department of the Air or Air Force, and as none of the paragraphs under the General Policy heading would interfere with the later consideration of an organization under a Secretary of Air, or the organization of an Air Force, it should be so stated in the General Considerations. There was further discussion by most of the members, and the last statement, I believe, by Dr. Stratton, who stated that the Committee had given a great deal of time and consideration to the question of a separate Air Service, or Air Force and that it (the Committee) could not recommend it, but that there is nothing in what the sub-committee has agreed to that would be inconsistent with the later consideration of some form of separate air service.

"The chair considered it advisable that a sub-committee of the Sub-Committee be appointed to prepare the report, whereupon a committee, with Dr. Waldon as Chairman, General Menoher, Admiral Taylor, Dr. Stratton and Mr. Zoll, was appointed to convene in the afternoon at four o'clock and consider a redraft by Mr. Waldon in the preparation of a report. We adjourned at one o'clock, Mr. Russell and I waiting for the adjournment of the sub-committee, headed by Mr. Waldon, to ascertain what agreements had been reached on the re-draft, knowing that if the small committee agreed to the things that were desired and discussed, Mr. Russell and I could leave Washington that night to attend to important personal business. Mr. Waldon came to my room in the Willard at eleven o'clock that night with the freshly typed re-draft, that contained 'Paragraph 13', which we felt would be satisfactory, and Mr. Waldon did not consider it necessary that we stay in Washington, as the important features had been taken care of, and, as I look back on the conferences and the paragraphs contained in the report, I feel that the recommendations are all sound and do not in any way appear inconsistent with the later expansion of the Department of

Air, and I believe the recommendations of the Advisory Committee for Aeronautics contain some immediate help and relief during the interim required to have a proper consideration of the most vital questions of the proper governing and directing 'machinery' necessary to advance military and civil aeronautics in the United States.

"It is very difficult to give you a correct picture of the work of the sub-committee, and, since it has been deemed inadvisable under the President's letter to consider some form of separate air service, I believe that the report of the National Advisory Committee for Aeronautics, together with the letter signed by Mr. Waldon, Mr. Russell, Major Kilner and myself, has dealt with the subject as well as could be expected under the circumstances, and I hope that the President will see fit to ask for a specially organized committee of the best qualified men in the United States to cover the report to him on all phases of the subject."

Statement of Frank H. Russell

"I have your wire requesting information with reference to the atttitude of the civilian members of the Sub-Committee of the National Advisory Committee for Aeronautics concerning the recommendations recently made to the President. Your telegram indicates that there is a lack of understanding both within and without the committee concerning this question.

"The consideration of the committee brought out very clearly that aeronautical development in the United States depends primarily on the attitude of the government thereto. It was shown that already the need for aircraft has manifested itself not only in the operation of the Army, Navy and Post Office, but also in the Departments of Agriculture, The Treasury and Commerce. This is entirely aside from the problems of the unification of the military air forces. The tactical and strategical questions involved in the matter of unification of military forces in the air, like similar problems on water and land, should of course be primarily a problem for naval and military experts. While there has been a marked degree of cooperation between the departments above named, the fact remains that the development of aeronautics is costing the public considerably more than it should, through the duplication of designing, engineering, constructing and field endeavors. The industry has been forced to feel its way blindly since the war, without any unified policy on the part of the government. This has resulted in a waste of money in the industry which can hardly be spared at the present time.

"For these reasons I suggested at the first meeting of the conference that consideration be given to a centralized branch of the government devoted exclusively to the development of aeronautics for commercial needs and in so far as was practical for military requirements. The same thought was expressed by Mr. Martin on the second day of the conference and by Mr. Waldon the third day, at the close of this session, both Mr. Martin and I were assured that the matter would be covered in the committee's report.

"Its omission from the report necessitated a separate letter, written by Mr. Waldon to Dr. Walcott. The committee's report, however, did suggest the appointment by the Advisory Committee, of a sub-committee made up of Army, Navy and Post Office officials with two civilians from the industry itself, 'who shall survey the engineering and production facilities of the aircraft industry and shall recommend a policy calculated to sustain and develop the industry to meet the needs of the government'.

"I sincerely hope that this recommendation may find favor and that the questions involved in this matter of government control of aeronautics may be carefully and thoroughly investigated. This must be done to the end that the public moneys expended on aeronautics may be efficiently used for the development of this new agency, along lines which will make this country preeminently strong in the air as the best guarantee of national security in times of war and the greatest service to its people in times of peace.'

Statement of Dr. C. D. Walcott

"The sub-committee held meetings on April 5, 6, 7 and 8, and at the last meeting an opinion was expressed by two members (Mr. Waldon and Major Kilner) that the report of the committee should include a statement to the effect that nothing contained in the report is to prevent the consideration of a Unified Air Service or an Independent Air Force at some later date. (Two members, Messrs Russell and Martin, were absent from this meeting.) A resolution was offered that the report include such a reference to a Unified Air Service or an Independent Air Force. After discussion, this resolution was laid on the table by a vivavoce vote, only two members supporting it. The sub-committee then proceeded with the final preparation of its report as a whole, and when the vote was put upon the motion to approve the report as a whole for transmission to the President, through the Executive Committee of the National Advisory Committee for Aeronautics, there was no dissenting vote. The Chairman then asked if any member desired to make a motion to take the resolution which had been laid on the table, and there was no response to this suggestion.

"A special meeting of the Executive Committee of the National Advisory Committee for Aeronautics followed immediately upon the adjournment of the Sub-Committee on Federal Regulation of Air Navigation etc. The report of the sub-committee was submitted, considered by the Executive Committee, and approved by unanimous vote of the members present. Following are the names of the members present at this meeting of the Executive Committee:

Dr. Joseph S. Ames, Chairman;
Dr. S. W. Stratton, Secretary;
Rear-Admiral D. W. Taylor, Chief Constructor, U. S. Navy;
Major General Charles T. Menoher, Chief of Army Air Service;
Captain W. A. Moffett, Director of Naval Aviation;
Professor Charles F. Marvin, Chief of the Weather Bureau;
Dr. Charles D. Walcott.

"On the evening of the same day (April 8), Mr. Waldon handed to the Chairman a memorandum requesting that a certain statement be inserted in the report to the President. This memorandum was signed by Mr. Sidney D. Waldon; Major W. G. Kilner, U. S. A.; Mr. Glenn L. Martin; Mr. Frank H. Russell, the latter two names being attached by Mr. Waldon acting under authority from them. The report at that time had been fully prepared, and the Chairman did not feel that he was authorized to include the memorandum as a part of the report approved by the sub-committee and the Executive Committee. He therefore wrote a separate letter to the President under the same date the report was transmitted (April 9), to which a memorandum was attached embodying the substance of the memorandum handed to the Chairman by Mr. Waldon. That memorandum stated that the four gentlemen whose names were signed to it were of the opinion that the President's letter justified the consideration of a Department of the Air, a Unified Air Service, or an Independent Air Force, but, having been over-ruled by a majority of the committee, they urged "that the President direct the National Advisory Committee for Aeronautics to re-convene the same sub-committee to investigate, with a view to making definite recommendation as to the relative merits of

"a. The situation as it will exist under the plan proposed in this report, in which aeronautics will be divided among the Departments of War, Navy, Commerce and Post Office;
b. A Department of the Air;
c. A Unified Air Service;
d. An Independent Air Force."

"Mr. Waldon has since approved the memorandum in the form submitted to the President with the Chairman's letter of April 9.

"It appeared to be the judgment of the majority of the committee though not expressed in its report, that it was not called upon to express an opinion on a Department of the Air, a Unified Air Service, or an Independent Air Force, and that its recommendations, if carried into effect, would be constructive, and not in any manner interfere with any future re-grouping of aviation activities, should that be concluded to be desirable.

"No motion was made during the meetings of the Sub-Com-

mittee to incorporate in its report the request for further action on the part of the President which was later urged by four members in the memorandum referred to. There was no motion to include a minority report, nor was any notice given that a minority report would be submitted. Hence the Chairman did not feel justified in considering the memorandum handed to him by Mr. Waldon as a minority report. In fact, nothing is stated in the memorandum itself to the effect that it is a minority report. It does not express any differences from the recommendations contained in the report, but, on the contrary, goes beyond the scope of the report, urging that the President request the National Advisory Committee for Aeronautics to make another investigation and another report to the President containing definite recommendations as to the relative merits of a department of the Air, a Unified Air Service, and an Independent Air Force."

Secretary Denby Launches Merchant Seaplane

Navy Head Anxious to Stimulate Commercial Aviation by the Use of Navy Seaplanes Converted into Commercial Carriers

The first of a series of naval flying boats converted into commercial carriers was launched last week by Secretary of the Navy Denby in the presence of a distinguished assemblage, comprising Captain W. A. Moffett, Chief of Naval Aviation, members of the Senate and House, the Naval Affairs Committee, foreign air attaches, and many others. These seaplanes belong to the well known Navy HS-2L coast patrol flying boats which rendered signal service during the war in patrolling the entire Atlantic Coast and in convoy work. The boats have been converted into six-place commercial carriers by the Aeromarine Plane and Motor Co., of Keyport, N. J., and

CAPT. W. A. MOFFETT, DIRECTOR OF NAVAL AVIATION, AND SECRETARY OF THE NAVY DENBY
Photo U. S. Navy

are equipped either with a cabin or with open cockpits. The power plant is composed of a 400 hp. Liberty engine, driving a pusher propeller, which gives the machine a maximum speed low down of 75 m.p.h. The overall span of these boats is 72 ft.

In launching these boats, Secretary Denby said that he "considered it of very real importance that our people become familiar with the present day safety and the advantages of commercial aviation. Therefore, in order to stimulate interest in commercial aviation, so that we will have trained men available for national defense in case of an emergency, the Navy Department has allowed a limited number of these well-known aircraft to be sold to the public at one-third their actual cost."

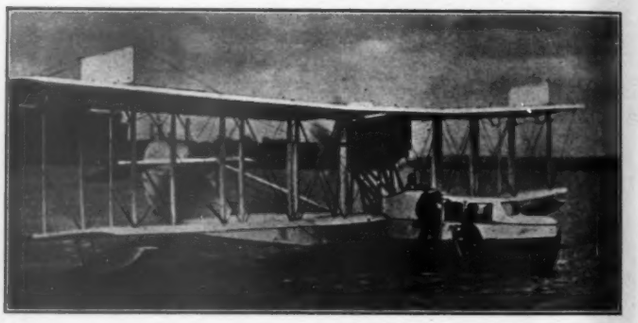
It is believed that those interested in aviation and desirous of keeping American aeronautical activities abreast of foreign accomplishments will quickly take advantage of this opportunity to procure equipment of such proven reliability at so low a figure.

After the launching Mr. Denby, together with officials of the Aeromarine Co., took passage in the seaplane and made a flight over Washington, circling around Washington monument, and concluding with a trip to Mount Vernon.

This is the first time that a Cabinet member has taken such an important step to encourage commercial aviation and impress the people with the safety of flying.

14,000 Passengers Carried by Aero Limited

Aero Limited, Inc., which claims the distinction of being the pioneer air transport firm in the United States, having been formed in 1919 and having been in continuous operation ever since, has to date carried 14,000 passengers without any accident. This is a highly gratifying record and it bears out



SECRETARY DENBY GOING ON BOARD THE AEROMARINE COMMERCIAL FLYING BOAT
Photo U. S. Navy

the contention that an air transport line which is operated on safe and sane principles does not involve any more hazards for passengers than any other means of transport.

Aero Limited exclusively operates flying boats. Its fleet consists mainly of converted HS-2L Navy flying boats fitted with the Liberty-12 engine. During the winter months the machines are used for a transport service between Miami, Fla., the Southern headquarters of the company, and Bimini and Nassau, B.W.I. Special flights are also made on request to various resorts of the Florida coast. When the mild season sets in, the flying boats go north and operate in the vicinity of New York in sightseeing work, with special trips to Atlantic City, Newport, Boston, etc. One of the boats of Aero Limited holds the record for the fastest flight between Miami and New York, the total elapsed time being 15 hr. 35 min.

New executive offices of the company will be opened in the Gotham Bank Building, New York, beginning about May 15. Branch offices or special representatives of Aero Limited are besides located at Havana, Cuba; Nassau and Bimini, B.W.I.; Isle of Pines; New York; Boston; Lake George; Newport, R. I.; Palm Beach and Miami, Fla.

Aero Limited recently acquired exclusive control of United Air Lines of America.

State and Local Air Laws and Ordinances

The following are abstracts of the laws dealing with air navigation at present in force in States and Municipalities of the United States and Possessions:—

States of Connecticut, Massachusetts, New York, Kansas. Towns of Nutley, N. J., Kissimmee, Fla. Cities of Newark, N. J., Atlantic City, N. J., New York, N. Y. County of Los Angeles, Territory of Hawaii.

STATE OF CONNECTICUT

June 8, 1911

Registration of machine. Owner files annually with Secretary of State his name, residence and address and description of each aircraft. Secretary of State will assign distinguishing number and issue certificate of registration. Certificate to be carried at all times on the aircraft.

Fee. $5.00.

Transfer of Machine. Upon transfer, registration expires, former owner to inform Secretary of State of transfer and return certificate.

Markers. Display in conspicuous place plate bearing number assigned, in letters not less than 5 ft. in height.

Revocation. Secretary of State may suspend or revoke for any cause he may deem sufficient.

Licensing of Operator. Operator must be 21 years old and obtain license from Secretary of State, except to operate over property owned or leased by him or over property of others where permission from owner has been granted him. License granted after examination in manner determined by Secretary of State, or when applicant holds certificate from recognized aero club. Unlicensed operator over 21 may operate in company of licensed pilot. Number assigned each license. License must be carried at all times.

Fees. For examination, such sum as Secretary of State may requre up to $25.00. For license, $2.00.

Revocation. Secretary of State may suspend or revoke for any cause he may deem sufficient.

Non-residents. May operate 10 days if home state laws complied with.

Penalties. Failure to comply with any provisions may result in fine not more than $100 or 6 months imprisonment, or both.

Responsibility for damage. Pilot responsible for all damages suffered by any person. If agent or employee, the principal or employer is held.

Nomenclature. "Airship"—any flying vehicle.
"Aeronaut"—any person who undertakes to direct its course.
"Fly"—every kind of locomotion by an airship.

STATE OF MASSACHUSETTS

October 11, 1919.

Registration of machine. Application should be made to Department of Public Works, Division of Highways.

Fee. $2.00.

Markers. Machines must carry identification number of such size, displayed in such a manner as may be ordered by the Division of Highways, when issuing registration certificates.

Licensing of Operator. Applicant to file application with Division of Highways, Department of Public Works. State may issue, without examination, license to pilots who at any time were commissioned in the Army, Navy or Reserve and to any applicant who has otherwise passed an examination satisfactory to the commission. Provisions do not apply to military or naval aviators in service.

Fees. $5.00.

Revocation. Following hearing, license may be definitely revoked.

Penalties. Not less than $10.00 nor more than $500 or imprisonment for not less than one month or more than six months or both.

Minimum altitude. Operator must not fly at such an altitude as to endanger his own life or the safety of those below, or the safety of his passengers; or very thickly settled districts save in starting or alighting.

Restricted areas. Highways and public grounds, and thickly settled district in any city or town, except for the purpose of starting or alighting on designated landing places.

Miscellaneous. Forbidden to perform dangerous maneuvers over massed assembly of 100 or more persons; or drop any article in flight, except over grounds devoted to flying or open water.

Nomenclature. Ordinance applies to all "aircraft".

STATE OF NEW YORK

March 30, 1920.

State legislature passed resolution urging the Congress of the United States to enact federal air laws.

STATE OF KANSAS

April 4, 1921

Registration of machine. Owner files annually with Secre-Treasurer on suitable blank furnished by State Aircraft Board, setting forth name, make, model, description of aircraft and engine. Name and address of owner, etc. Aircraft Board to inspect aircraft. Manufacturers or dealers may obtain a general number for all aircraft manufactured or dealt in by them. Board will issue general certificate and three license plates. Fee for registration $20. $1. for each additional set of double plates of the number assigned.

Fee. $15.00.

Transfer of Machine. Number plate issued shall remain on aircraft and vendor notifies board of sale or transfer, giving all details together with fee of $1.00.

Markers. Number plate and certificate furnished by aircraft board. Marker must be conspicuously displayed on aircraft.

Licensing of Operators. Pilots must submit qualifications to Aircraft Board and be registered.

Fee. $10.00.

Non Residents. Provisions as to registration and licensing will not apply to non-residents for 30 days, provided laws of home state regarding registration and licensing have been complied with. Non-residents engaging in commercial aviation for hire must comply with the Kansas law as if he were a resident.

Penalties. For piloting any aircraft without license, not less than $25. or more than $500. For violation of any other provision not less than $25. and not more than $500.

Minimum altitude. 250 ft. over any premise or 1,000 ft. limits of any city, except in the event of fire, forced landing or at beginning or end of flight.

Miscellaneous. Forbidden to engage in acrobatics over limits of any city or center of population or to fly at a height lower than that enabling a glide in any emergency and at all times to a known or established place on land or water. Provision does not apply to aircraft owned by the Government or to pilots in the service of the Government.

Forbiddden to discharge ballast or else from aircraft.

Nomenclature. "Aircraft" to include any "airplane, hydroplane, seaplane, dirigible, balloon or other apparatus carrying one or more passengers into or through the air propelled by currents or by power or motors contained in said apparatus; the pilot shall include "any person" directing navigation.

TERRITORY OF HAWAII

March 22, 1915.

Licensing of operators. Operator of any aircraft must obtain license from the Government. Members of the Army, Navy, National Guard of Hawaii or Naval Militia of Hawaii air services, excepted.

Penalty. Not more than $1,000 or one year's imprisonment, or both.

KISSIMMEE, FLORIDA
July 17, 1908.

Registration of machine. No provision, but permission of Council must be obtained for the maintenance of "airship" shed, barn, garage, station, depot, etc.

Fee. Annual license tax, $100 for each place of business, as above. Annual license tax imposed on all airships kept or used for hire, graded as follows: "Baloons, stationary, $20.00; powerless, $30.00; dirigible, $50.00; Aeroplanes, $100; helicopters, $150; ornithopters, $200; all other types, $300." Increase 10 per cent for 5 to 15 passengers; 20 per cent for 15 to 30; 35 per cent for 30 to 60 passengers; 50 per cent for 60 to 100 passengers; 100 per cent for 100 to 500; 200 per cent for 500 to 1000; and 400 per cent for 1000 and over. No tax on aerial freight lines for term of 15 years.

Penalties. Not more than $500 or imprisonment in "the town calaboose" for not more than 90 days, or both.

Minimum altitude. 10 ft., or within 20 ft. at speed greater than 8 mi. per hr., or within 50 ft. at over 15 mi. per hr., or within 100 ft. at over 25 mi. per hr., or within 2000 ft. at more than 50 mi. per hr., or within 500 ft. at over 100 mi. per hr.

Lights and instruments. "All such balloons or airships shall be properly equipped with and shall use such bells, whistles or horns, brakes, lights and other signalling and controlling apparatus, and nets, parachutes, flying belts and artificial wings and other safety apparatus," as prescribed by the U. S. Government.

Miscellaneous. Unlawful to drop articles, or collide with telegraph and telephone poles, etc.

NEWARK, NEW JERSEY
May 6, 1920.

Licensing of Operator. Operator must have a license issued by U. S. Govt.

Penalties. $100 first offense; $200, subsequently.

Minimum altitude. 4000 ft., except in starting or alighting.

Restricted areas. Central portion of city.

Lights and instruments. Lights fore and aft, carry maps of routes, compass, landing flares which latter shall be used for starting or alighting at night.

Miscellaneous. Unlawful to drop any article. Unlawful to distribute circulars except on obtaining license for purpose from the Dept. Public Safety; fee $25 and bond $1000. Exhibition flights in or over city unlawful except on obtaining permission from Dept. Public Safety.

Nomenclature. Ordinance applies to "any aeroplane, gas bag, flying machine or any heavier than air or any mechanical contrivance used for flying."

COUNTY OF LOS ANGELES, CALIF.
June 16, 1920.

Registration. Application to be made to Aircraft Department, describing machine. Examination made by County Inspector of Aircraft. Registration may be suspended by Department if machine is not satisfactory.

Fee. $2.00 per seat annually.

Markers. Number plate furnished by Aircraft Department to be displayed at all times.

Licensing of operators. License must be obtained from Aircraft Examining Board. Application specifies kind of aircraft for the operation of which license is sought. Must be counter-signed by two persons who themselves hold such licenses or are licensed pilots in the International Aeronautic Federation. Applicants must be 18 years of age and have had 10 hours minimum flying in a "balloon or flying machine" or 25 hours in charge of an airship.

Fees. $2.50 annually.

Revocation. May follow arrest three times in 60 days followed by conviction, or upon two arrests in 60 days followed by conviction for violation of various regulations. Suspension of license for 30 days may follow violations of other provisions.

Non-residents. Temporary certificate of registration may be issued by Aircraft Department for period of less than 60 days and more than 5 hours in any one month.

Penalty. Not over 30 days in jail or not more than $500 or both, for first offense; or imprisonment not over 90 days for second offense; and not over six months for third or subsequent.

Minimum altitude. 100 ft., except in starting or alighting.

Miscellaneous. Forbidden to conduct any aircraft in a reckless manner endangering the safety of persons or occupants of the aircraft. Unlawful to fly a kite or captive balloon having metallic cable within 1000 ft. of any high voltage electric wire. Free balloons have right of way over airships, airships over airplanes. Compliance with definite rules of the air embodied in the ordinance is required. Dropping of ballast other than fine sand prohibited.

Nomenclature. The word "aircraft" comprises all devices for aerial locomotion. "Flying machine" means all airplanes, seaplanes, flying boats, or other aircraft heavier than air having means of propulsion, and "aviator pilot" is the operator of any flying machine. "Aeronaut pilot" is the operator of any airship or balloon.

NUTLEY, NEW JERSEY
Aug. 22, 1916.

General. No person shall descend into Nutley from any aircraft by means of a parachute or similar contrivance not under complete control. Forbidden to drop any article from aircraft.

Penalty. $25.00 first offense; imprisonment for 30 days for each and every subsequent violation.

ATLANTIC CITY, NEW JERSEY
June 24, 1920.

Registration of machine. None, except operator must produce satisfactory proof to Director of Public Safety the machine is fit for purpose.

Licensing of operator. Must have certificate of Aero Club of America or U. S. Government license.

Penalties. $100 for first offense; $200 for each subsequently.

Minimum altitude. 3000 ft., except starting or alighting.

Lights and instruments. Light fore and aft, maps of routes, compass and landing flares, which latter shall be used for landing or alighting at night. Exhibition flight unlawful except on permit from Director of Public Safety.

Miscellaneous. Unlawful to operate to disturb peace and quiet and to drop any article. Distribution circulars prohibited except on permit from Director of Public Safety.

Nomenclature. Ordinance applies to any "aeroplane, gas bag, flying machine, balloon or other vehicle heavier than air, or any mechanical contrivance used for flying."

CITY OF NEW YORK
Feb. 23, 1921.

Miscellaneous. Unlawful to drop any articles, including circulars, except over place established for the purpose. Forbidden to give any demonstration involving acrobatic maneuvers which may tend to divert the aircraft from normal flight. Aircraft approaching each other shall pass to the right. Lighter-than-air craft at all times have right of way.

Penalties. $50.00 or not more than one year's imprisonment, or both.

Minimum altitude. 2,000 ft., except at beginning or end of flight.

Nomenclature. "Aircraft" includes any flying apparatus. "Pilot" is any person in flight who undertakes to direct movements of the machine; "flight" includes any kind of locomotion by aircraft.

E. R. Morton Joins Fairchild Co.

The Fairchild Aerial Camera Corp. has recently secured the services of E. R. Morton as Technical and Research Engineer.

Mr. Morton was formerly retained by the Science and Research Department of the United States Air Service at the Bureau of Standards, Washington, D. C., and Langley Field. He is given credit for developing the technique of testing camera mounts and for extensive experimental work leading to the scientific design of airplane camera mounting. The mounts for the Deram and K cameras were the immediate results of his work and when tested at Langley Field, he determined the practical proof of the theory.

"Who's Who in American Aeronautics"

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Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Charles De Forest Chandler

CHANDLER, CHARLES DE FOREST, Col. Air Service, retired; born, Cleveland, Ohio, Dec. 24, 1878; son of Frank M. Chandler and Effie May (Barney) Chandler.

Educated: Public schools, High School, Case School of Applied Science, Cleveland, Ohio; Army Signal School, Ft. Leavenworth.

Professional: Officer, U. S. Army, 1898-1899 and from Feb. 2, 1901 to date.

Aeronautical Activities: Oct. 22, 1906, first balloon voyage; first airplane flight 1909, with Wilbur Wright; Commanding Officer of first army aviation schools, College Park, Md. and Augusta, Ga., 1911 to 1913; Officer in Charge Aeronautical Division, Signal Office, War Department from Aug. 1907 to May 1908; member of Board of Officers conducting Wright airplane trials at Fort Myer, Va., 1909.

Flying Rating: Qualified Balloon Pilot, 1907; pilot certificate No. 8, Aero Club of America; Aviation Pilot Certificate No. 59, Aero Club of America; Military Aviator, War Department, July 1912; Expert Aviator Certificate No. 5, Aero Club of America.

War Service: Commanding Officer, Army Balloon School, Ft. Omaha, Nov. 1916 to April 1917; Chief, Balloon Division, Washington, April to Oct. 1917; Chief, Balloon Section, A. E. F., France, Nov. 1917 to Feb. 1918; Chief, Balloon and Airship Division, Army Air Service, March 1918 to Oct. 16, 1920.

Member: Aero Club of America; The Lambs; Chevy Chase Club; Army and Navy Club (Wash.); Army and Navy Club (Manila); Cleveland Athletic Club; Military Order Carabao; Military Order Foreign Wars; American Legion.

Present Occupation: Retired Army Officer.

Address: 1424 K St., N. W., Washington, D. C.

Ralph C. Diggins

DIGGINS, RALPH C., Commercial Aviator; born, Cadillac, Mich., March 7, 1887; son of Albert B. Diggins and Emma J. Diggins; married, Alma Eske, Jan. 1, 1913.

Educated: Harvard High School; 1904-1905, University of Illinois; 1905-1908, University of Michigan; B. S. Marine Eng.

Professional: Prof. Mathematics and Science, 1909-1913; Athletic Director, 1909-1913; Flying, 1912-1913; Associated Theatres Co., 1913-1917; Army Air Service, 1917-1918; Commercial Flying, 1919-1921.

Aeronautical Activities: Flying, 1912-1913 exhibitions, Curtiss Pusher, Queen Monoplane; 1917-1918, U. S. Army Air Service, A. E. F., 92nd Squadron Night Bombing; 1919-1921, School of Flight and Commercial Flying, Chicago, Ill.

Flying Rating: Certificate No. 1719, June 19, 1918, International Federation of Aeronautics.

War Service: 2nd Lieut. Army Air Service, July 3, 1917 to Jan. 3, 1919.

Member: Aero Club of America, Illinois; Aviation Club of Chicago.

Present Occupation: Commercial Aviation; President, Ralph C. Diggins Co.

Address: 140 N. Dearborn St.; home, 4930 Sheridan Road, Chicago, Ill.

Marshall Stanley Neal

NEAL, MARSHALL STANLEY, Automobile business; born, Knsas City, Mo., April 20, 1890; son of F. P. Neal and Ida D. Neal.

Educated: Yale University 1911 S, Ph. B.

Professional: President, Kansas City Terra Cotta Co., 1913-1915; Vice President, Employer's Indemnity Corp., 1915-1917; President, Neal Motors Co., 1919-1921.

Aeronautical Activities: Ground school, Nov. 1917 to Feb. 1918; commissioned 2nd Lieut. at Carruthers Field, Ft. Worth, Tex., April 1919; instructor 3 months; officer in charge of flying, June to Oct.; discharged Dec. 12, 1919.

Flying Rating: Reserve Military Aviator, April 8, 1918.

War Service: Army, Nov. 1917 to Dec. 1918.

Member: Kansas City Club; Kansas City Country Club.

Present Occupation: Motor car business.

Address: 1514 Grand Ave., home, 400 E. Armour Blvd., Kansas City, Mo.

Charles Matthews Manly

MANLY, CHARLES MATTHEWS, Engineer; born, Staunton, Va., April 24, 1876; son of Charles Manly and Mary Helen (Matthews) Manly; married, Grace Brayton Wishart, June 9, 1904.

Educated: Private schools in Greenville, S. C.; Master Mathematics, 1896, Furman University, Greenville, S. C.; M. E., 1898, Cornell University.

Professional: June 1898 to April 1905, Chief Assistant to Dr. S. P. Langley in aviation development work and the construction and test of the man carrying aeroplane for U. S. War Department; Vice President and Chief Engineer, Manly Drive Co., 1906-1915; President, S. A. E., 1919; Chairman, aviation division, S. A. E., standards committee, 1917-1919.

Aeronautical Activities: See Langley Memoir on Mechanical Flight; one of the judges, International Aviation Tournament, Belmont Park, Oct. 1910; Member Contest Committee, Aero Club of America, 1906-1915; Consulting Engineer to British War Office Aviation Section, June to Sept. 1915; flew 450 feet, Oct. 7, 1903; Consulting Engineer since that time.

War Service: Member, American Aircraft Board Commission to International Aircraft Standardization Conference, London, 1918; member, International Aircraft Standards Board, 1917-1918.

Books: "Langley Memoir on Mechanical Flight", published as Part III of Vol. 27, Smithsonian Contributions to Knowledge.

Member: Aero Club of America; Society of Automotive Engineers; American Society of Mechanical Engineers; Engineer's Club of New York; Cosmos Club (Wash.).

Present Occupation: Consulting Engineer (firm of Manly & Veal).

Address: 250 West 54th St., New York City; home, 210 Abingdon Road, Kew Gardens, Long Island, N. Y.

Peter Cooper Hewitt

HEWITT, PETER COOPER, Inventor; born, New York City, March 5, 1861; son of Abram Stevens Hewitt and Sarah Amelia (Cooper) Hewitt; married, Maryon J. Andrews, Dec. 21, 1918.

Educated: Stevens Inst. of Tech.; Sc. D., Columbia University, 1903; Sc. D., Rutgers College, 1916.

Professional: Scientist and Inventor; inventor of Cooper Hewitt Lamp.

Aeronautical Activities: Designed and constructed a helicopter; gave successful demonstrations in 1918.

War Service: First Vice Chairman, Naval Consulting Board of the United States.

Member: American Institute of Electrical Engineers; Century Association; Union Club; University Club; Knickerbocker Club; Aero Club of America.

Present Occupation: Scientist and Inventor.

Address: 18 East 33rd St., New York City; home, Ringwood Manor, Ringwood, Passaic County, N. J.

William Jay Fitzmaurice

FITZMAURICE, WILLIAM JAY, Major, Air Service; born, Fremont, Ohio, July 26, 1885; son of Michael J. Fitzmaurice and Elizabeth E. Fitzmaurice.

Educated: Bucyrus, Ohio High School; 1908, U. S. Military Academy.

Professional: 2nd Lieut., 1st Lieut., and captain of Infantry, Regular Army, 1908-1917; served in Alaska, Panama and United States.

Aeronautical Activities: Primary training Rockwell Field, Calif., Feb. to May 1918.

Flying Rating: Junior Military Aviator, May 31, 1918.

War Service: Major, Air Service, Jan. 1918; Executive Officer, D. M. A. (operations section) Washington, D. C., June to Sept. 1918; General Staff, Nov. 1918 to Feb. 1919.

Present Occupation: Commanding, Montgomery Air Intermediate Depot.

Address: Air Intermediate Depot, Montgomery, Ala.; home, 1600 N. Kingsley Drive, Hollywood, Los Angeles, Calif.

Harold Geiger

GEIGER, HAROLD, Major, Air Service; born, Plainfield, N. J., Oct. 7, 1884; son of Fred C. Geiger and Josephine D. Geiger; married, Frances M. Bridges, Sept. 15, 1914.

Educated: High school, East Orange, N. J.; U. S. Military Academy.

Professional: Commissioned officer, U. S. Army.

Aeronautical Activities: Attached to Signal Corps, U. S. Army for Aviation duty, April 1912; preliminary training at College Park, Maryland and at Hammondsport, N. Y. (Curtiss School); duty at College Park and at North Island, San Diego, 1912 and 1913; at Honolulu, H. T., 1913 and 1914; at San Diego, 1915; relieved from aviation duty 1915; ordered to U. S. Army Balloon School, April 1917; completed course for Balloon Observer, same year; served in Office Chief Signal Officer (Flying Division) and office Director Military Aeronautics, Dec. 1917 to Aug. 1918; overseas, Aug. 1918 to July 1919; served overseas with Balloon Section Hqts. S. O. S., A. E. F., Hqts. 1st Army, A. E. F., Hqts. 5th Corps, 1st Army, A. E. F.; after Armistice, placed on research and investigation work in connection with dirigibles, England, Italy, and France; completed course of instruction (dirigible) at Centre Ecole D'Aeronautic, Rochefort, France and completed partial course of instruction at the Italian Airship School, Champino, Rome, Italy; served in Office Director Military Aeronautics, Aug. 1919 to March 1920; command the Army Balloon School, Ross Field, Calif., March 1920 to March 1921; Assistant Military Attache (Aviation), the Hague, Netherlands, to date.

Flying Rating: Certificate, Military Aviator (Signal Corps); Junior Military Aviator; Junior Military Aeronaut; Balloon Observer; Brevet (France) Pilote de Dirigeable.

Member: Aero Club of America.

Present Occupation: Military Attache (Aviation), Netherlands.

Address: The American Legation, The Hague, Netherlands.

Wallace Arthur Rowell

ROWELL, WALLACE ARTHUR, Salesman; born, Menomonee Falls, Wis. July 7, 1888; son of George Wayne Rowell and Mary (Walsh) Rowell.

Educated: Grammar and high schools; Beloit College.

Aeronautical Activities: Entered army ground school, Austin, Tex. July 7, 1917; finished flying training at Kelly Field in Dec. 1917; started as instructor on dual stage, Kelly Field, Dec. 1917; commissioned 1st Lieut., Jan. 1918; instructed on dual stage until July 1918 when became assistant officer in charge of the dual stage; ordered to Bolling Field, Washington, D. C., Aug. 1918; Officer in charge of Field and Hangars at Bolling Field.

Flying Rating: Reserve Military Aviator, Jan. 26, 1918.

War Service: Enlisted, April 14, 1917; discharged as 1st Lieutenant, Feb. 17, 1919.

Present Occupation: Traveling Salesman for The International Harvester Co.

Address: Minneapolis, Minn.; home, 1497 Como Ave., W. St. Paul, Minn.

Edward Buck Hamer

HAMER, EDWARD BUCK, Insurance; born, Marion, S. C., March 6, 1896; son of Philip B. Hamer and Gertrude B. Hamer.

Educated: Graded and high schools of Marion, S. C.; 1916, A. B., Wofford College, Spartanburg, S. C.

Professional: Nov. 1916-May 1917, bookkeeper, Marion National Bank; July 1919-Dec. 1920, ranching in Colorado; Feb. 1, 1921, insurance agent, Hamer & Lewis, Inc., Marion, S. C.

Aeronautical Activities: Oct. 1917-Feb. 1918, Hazelhurst Field; Feb. 1918-Sept. 1918, Kelly Field; Sept. 1918, Brooks Field; Oct. 1918-Dec. 1918, Barron Field.

Flying Rating: Flying Instructor.

War Service: Enlisted, May 14, 1917; commissioned 1st Lt. Air Service, Signal Reserve Corps, Jan. 18, 1918; discharged, Dec. 17, 1918.

Present Occupation: General Insurance.

Address: Marion, S. C.

Maurice Connolly

CONNOLLY, MAURICE, Representative, Curtiss Co.; born, Dubuque, Iowa, 1877; son of Thomas Connolly and Ellen Frances (Brown) Connolly.

Educated: Private schools; Dubuque High School; Cornell University; New York Law School; Oxford, England; Heidelberg, Germany; A. B., 1897; LL. B., 1898; Iowa Bar, 1899.

Professional: President, Connolly Carriage Mfg. Co., 1904-1916; President, Carriage Builders National Association, 1908; Vice President, Dubuque Fire and Marine Insurance Co., 1904 to date; Vice President, Bank and Insurance Building Co., 1904 to date; Director, Iowa Trust & Savings Bank and other financial institutions, 1904 to date; special representative, Curtiss Aeroplane & Motor Corp.; prior to world war was in U. S. Congress from 3rd Iowa District, the only Democrat ever elected from said District; 1914, defeated Ex-Secretary of Agriculture, E. T. Meridith for Democratic nomination for U. S. Senate from Iowa; Chairman, Iowa State Democratic Convention, 1914; Delegate at Large, to National Democratic Convention, St. Louis, 1916; served on Resolutions Committee in said convention; on Military Affairs Committee House of Representatives, 1913-1915; Regent and member of Executive Committee of Smithsonian Institution, 1913-1916.

Aeronautical Activities: Commissioned Capt., A. S. S. C., July 5, 1917 and ordered to Chanute Field, Rantoul, Ill. as Post Adjutant; ordered to D. M. A., Washington, Chief Correspondence Secretary, Executive; May 1919, to Hazelhurst Field; about 35 hours in air in many cross country flights; Executive officer, Wilbur Wright Field; completed flying training here; with Eastern Victory Loan Flying Circus; commanded Cornell Reunion Flight.

Flying Rating: Reserve Military Aviator; Pilots' license, Aero Club, 1918.

War Service: Capt., A. S. S. C., July 5, 1917; Major, S. C., Oct. 23, 1917; Major, Air Service, 1918; received discharge, Oct. 27, 1919; Feb. 1920, commissioned Lt. Col., A. S. S. O. R. C.

Books: Political and Economic articles.

Member: Dubuque City Club; Dubuque Golf and Country Clubs; University Club of Chicago; Metropolitan Club; Chevy Chase; Army and Navy Club; National Press and Alfalfa Clubs; D. K. E. Cornell; Aero Club of America; American Legion.

Present Occupation: Financial connections in Iowa and special representative, Curtiss Aeroplane & Motor Corp.

Address: Garden City, L. I., N. Y.; home, 1637 Iowa St., Dubuque, Iowa.

Oscar Westover

WESTOVER, OSCAR, Major, Air Service; born, West Bay City, Mich., July 23, 1883; son of Emil Westover and Kunigunda (Gaertner) Westover; married, Adelaide Reginia Bainbridge, Dec. 31, 1907.

Educated: Kolb Grammar School; West Bay City High School; 1906, U. S. Military Academy.

Aeronautical Activities: Officer in charge, Signal Office, Port of Embarkation, Hoboken, N. J., Sept. 26, 1917 to March 18, 1918; Officer in Charge, Storage Depot, S. C., March 18, 1918 to June 8, 1918; Officer in Charge, Storage and Traffic Department, Bureau of Aircraft Production, June 9, 1918 to Nov. 18, 1918; Assistant Executive, Bureau of Aircraft Production, Nov. 19, 1918 to Jan. 3, 1919; Assistant Executive, Office Director of Air Service, Jan. 5, 1919 to June 30, 1919; Chairman Claims Board, Air Service, Aug. 6, 1919 to Aug. 31, 1919; Executive, Air Service, July 6, 1919.

Flying Rating: Balloon Observer, March 26, 1921.

Present Occupation: Director of Aircraft Production; Chief of Balloon and Airship Division, Office, Chief of Air Service.

Address: Air Service, Washington, D. C.

G. Hall Roosevelt

ROOSEVELT, G. HALL, Electrical Engineer; born, Neuilly, France, June 28, 1891; son of Elliot Roosevelt and Anna (Hall) Roosevelt; married, Margaret Richardson, May 17, 1913.

Educated: 1912, E. E., 1914, M. E., Harvard College.

Professional: Instructor, Graduate School of Engineering, Harvard University, 1913-1914; Substation Operator, Canadian Klondike Mining Co., Dawson City, Y. T., 1914-1915; Electrical Engineer, General Electric Co., power and mining, and railway applications 1916.

Aeronautical Activities: 1st Class Private, A. S. S. C.; enlisted July 11, 1917; Stationed at U. S. School of Military Aeronautics, Cornell University, Ithaca, N. Y. until Dec. 22, 1917; Gerstner Field, Lake Charles, La., until Aug. 6, 1918; Dorr and Carlstrom Fields, Arcadia, Fla., Aug. 6, 1918 to Jan. 1, 1919.

Flying Rating: Reserve Military Aviator.

War Service: 2nd Lieut., Air Service, May 3, 1918; 1st Lieut., S. O. R. C., Feb. 3, 1919.

Present Occupation: Electrical Engineer.

Address: General Electric Co., home, 211 Union St., Schenectady, N. Y.

Joseph Allison Steinmetz

STEINMETZ, JOSEPH ALLISON, Inventor; born, Philadelphia, Pa., March 22, 1870; son of John Steinmetz and Frances Morris (Janney) Steinmetz; married, Oma Frances Fields, 1903.

Educated: Philadelphia Central High School; special course in Metallurgy, Lehigh University, 1900.

Professional: Member of firm of Janney, Steinmetz & Co., established 1895, experts in design and production of seamless steel tanks, shells and pressure containers, poison gas, aerial drop bombs, and submarine Torpedo shells and mines.

Aeronautical Activities: Assisted Prof. Langley in producing seamless steel cylinders and shapes for Langley aeroplane; designed various devices for aerial warfare; founder and director, School for Aircraft Building, 1917-1918, Philadelphia; President, Aero Club of Pennsylvania, 1915-1921; overseas (civilian), special service, Dec. 1917 to March 1918.

War Service: Member, National Research Council, Engineering Division, Washington, D. C., 1918; member, Submarine Defense Association, N. Y., 1917-1918; commissioned Major, Ordnance (Reserve), March 1919.

Books: "Offensive Against the Submarine".

Member: American Society of Mechanical Engineers; Society of Automotive Engineers; Aero Club of America; Engineers' Club of Philadelphia; Sunnyside Golf Club; Philadelphia Cricket Club; Bankers' Club of America; Manufacturers' Club of Philadelphia; Sons of Revolution; Colonial Society; Barons of Runnemede; Naval and Military Order, Spanish American War.

Present Occupation: Member, firm of Janney, Steinmetz & Co.

Address: Morris Bldg., Philadelphia; home, 736 Westview St., Germantown, Philadelphia, Pa.

Douglas Blakeshaw Netherwood

NETHERWOOD, DOUGLAS BLAKESHAW, Major, Air Service; born, Birmingham, England, Feb. 4, 1885; son of Tom Netherwood and Ann (Wood) Netherwood; married, Harriet V. C. Bowne, April 30, 1919.

Educated: Public schools, McCulloch County, Texas; Agricultural and Mechanical College of Texas, B. S. M. E. 1908.

Professional: Served as private, corporal and sergeant, 20th Co., C. A. C., from July 30, 1908 to Aug. 6, 1911; appointed 2nd Lieut., C. A. C., Aug. 7, 1911; promoted 1st Lieut., C. A. C., July 1, 1916 and Captain, C. A. C., May 15, 1917; 1st Lieut., S. C., Aug. 20, 1914; Captain, S. C., July 1, 1916; Major. May 15, 1917; temporary Lt. Col., Air Service, Aug. 20, 1918 to Feb. 20, 1920; permanent commission as Major, Air Service, July 1, 1920.

Aeronautical Activities: Detailed for aviation duty in the Signal Corps, Dec. 10, 1913 and learned to fly at San Diego, Calif. in Wright Type "B" airplane No. 3; left San Diego for Philippine Islands, Jan. 2, 1916; on aviation duty Corregidor, Manila, P. I. until return to U. S., July 1917; duty O. C. S. O., Washington, D. C., Aug. to Nov. 1917; duty as Commanding Officer, Love Field, Nov. 21, 1917 to April 27, 1918; organized and established Aviation Repair Depot, Dallas, Tex. early in 1918 and commanded that station continuously until it was closed on March 28, 1921.

Flying Rating: Pilot license No. 312; expert aviator's certificate No. 41, Aero Club of America; Junior Military Aviator, Aug. 20, 1914; Military Aviator, Aug. 20, 1917; Airplane Pilot, 1920.

Member: Army and Navy Club, (Wash.).

Present Occupation: Executive Officer, San Antonio, A. I., Depot, San Antonio, Tex.

Address: S. A. A. I. D., Kelly Field, San Antonio, Tex.

Daniel Eric Ellis

ELLIS, DANIEL ERIC, Lawyer; born, Meeker, Colo., March 17, 1893; son of Charles F. Ellis and Adelia (Craig) Ellis; married, Thelma Lea Townes, Nov. 16, 1918.

Educated: 1916, A. B., University of California; 1917, University of Southern California; 1919, University of Denver.

Professional: Admitted to the bar, State of Mississippi, July 1920; practiced law in Oklahoma 1920-1921.

Aeronautical Activities: June 30, 1917, completed Ground School, University of California; commissioned 1st Lieut. A. S. S. O. R. C., Gerstner Field, La., Jan. 7, 1918; duty: Instructor, dual control, acrobatics, army corps, cross country, instructors school, combat; Stage Commander; Field Commander.

Flying Rating: Reserve Military Aviator, Rockwell Field, San Diego, Calif.; Aero Club of America Pilot Certificate No. 954; expert Certificate No. 125.

War Service: Enlisted Private 1st Cl. A. S. S. E. R. C., May 28, 1917; Commissioned 1st Lt. Reserve Military Aviator, Jan. 7, 1918; discharged Jan. 9, 1919.

Member: Aero Club of America; Pacific Aero Club; Aerial League of America.

Present Occupation: Lawyer.

Address: Glendora, Miss.

Arthur William Duckstein

DUCKSTEIN, ARTHUR WILLIAM, Advertising; born, Philadelphia, Pa., Feb. 24, 1890; son of Anthony P. Duckstein and Caroline (Mallon) Duckstein; married, Marie Louise Keemle, Nov. 5, 1914.

Educated: Public schools of Philadelphia; Central High ,School Philadelphia; University of Pennsylvania, 2 years.

Professional: 1908, Artist, Philadelphia "Inquirer", "Evening Telegraph", Baltimore "News"; 1912, advertising, A. McKim Ltd., Toronto, Canada and London, England.

Aeronautical Activities: Cadet, Fort Sill, Okla., Sept. 17, 1917 to Dec. 1917; 1st Lieut., A. S. S. R. C., Gondrecourt, Cazaux, Coetguidan, France, Jan. 1918 to July 1918; 1st Aero Squadron, A. E. F., July to Oct. 1918.

Flying Rating: Aerial Observer, A. E. F., 1918.

War Service St. Mihiel Offensive; three Major Offensives and Defensive Sector.

War Honors: Distinguished Service Cross for extraordinary heroism in action between Montrebeau and Exermont, France, Sept. 29, 1918. While on a special command reconnaissance to ascertain whether or not there was any concentration of enemy troops between Montrebeau and Exermont which might indicate a possible counterattack, he obtained information of the very greatest value. Flying over the enemy's lines at an altitude of less than 200 meters, in spite of most unfavorable atmospheric conditions, in the presence of numerous enemy aircraft, and under continuous heavy rifle and machine-gun fire from the ground, he spotted enemy troops massed for counterattack, and, although severely wounded by a machine-gun bullet from the ground, continued his mission until he had clearly and accurately located the position. He then returned and, though suffering from the pain of his wound, succeeded in writing out and dropping a clear and complete message. The counterattack, launched shortly afterward by a fresh enemy division, was crushed, and the accurate and timely information brought back by Lieut. Duckstein, after a very gallant flight under highly adverse conditions, was of the greatest importance in this success; Official credit, destruction of enemy ship, Sept. 15, 1918.

Member: Aero Club of America.

Present Occupation: Advertising (Picard & Co., Inc.).

Address: 16 W. 46th St., New York City.

Max Charles Fleischmann

FLEISCHMANN, MAX CHARLES, Capitalist; born, Riverside, Ohio, Feb. 26, 1877; son of Charles Fleischmann and Henrietta (Robertson) Fleischmann; married, Sarah Hamilton Sherlock, Dec. 20, 1906.

Educated: Public schools of Cincinnati; Franklin Preparatory School; Ohio Mechanic's Institute.

Professional: 1st Vice President, The Fleischmann Company, and officer in its allied interests.

Flying Rating: Hydro Airplane Pilot No. 48; Balloon Pilot No. 56; Junior Military Aeronaut.

War Service: Overseas 1917 with first Balloon Squadron; Commanding officer, Army Balloon School, A. E. F.; active service as Balloon Observer with 2nd, 4th, and 6th French Armies, and 2nd Balloon Wing, English Army, to study methods of French Balloon observation, before returning to the United States to instill the French methods of balloon training; acted as inspector of training, different balloon schools and later, commanding officer of U. S. Army Balloon School at Arcadia.

Member: New York Yacht Club; Santa Barbara Club.

Present Occupation: First Vice President, The Fleischmann Co.; rancher.

Address: The Fleischmann Co., New York City; home, Edgewood Ranch, Santa Barbara, Calif

Alexander George McAdie

MCADIE, ALEXANDER GEORGE, Meteorologist; born, New York City, Aug. 4, 1863; son of John McAdie and Anne (Senclair) McAdie; married, Mary Randolph Browne, Oct. 7, 1893.

Educated: New York public schools; College, City of New York; Harvard University.

Professional: District Forecaster, U. S. Weather Bureau, New Orleans, San Francisco; Prof. of Meteorology, U. S. Weather Bureau; Director, Blue Hill Observatory; Prof. of Meteorology, Harvard University.

Aeronautical Activities: Senior Aerographic Officer in the Navy, 1918-1919; overseas in 1918 establishing aerographic observatories at Naval Air Stations, Ireland, England, France.

War Service: U. S. Naval Reserve Force, Feb. 1, 1918 to June 5, 1919.

Books: "Principles of Aerography", Rand McNally Co., 1917; many scientific papers.

Member: Fellow, many learned societies, foreign and home.

Present Occupation: Prof. of Meteorology, Harvard University.

Address: Blue Hill Observatory, Readville, Mass.

What the Weather Bureau Does for Air Pilots

Aerological Service for Civil and Government Pilots

The United States Weather Bureau has recently made definite arrangements at all of its stations to supply special flying information on the winds and weather, present and prospective, to all applicants, whether governmental, commercial or individual. Fully equipped Meteorological Stations to the number of 193 are in operation over Continental United States and its possessions, and others are operated in foreign countries.

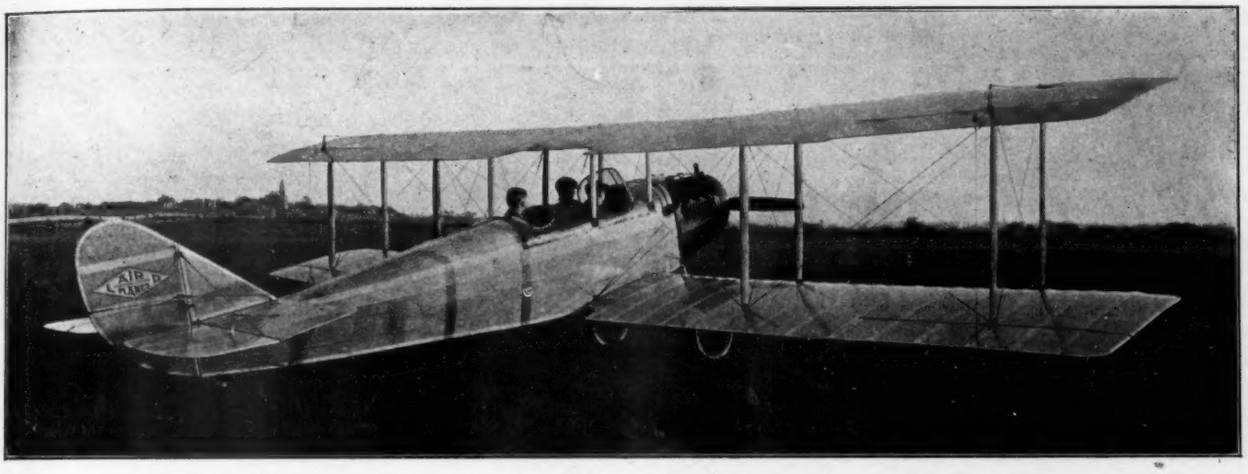
Officials of the Weather Bureau have, for many years, been keenly interested in aerial navigation, both aviation and aerostation. As early as 1907 a plan of cooperation between the Bureau and amateur balloonists was attempted as illustrated by the service given in the Gordon Bennett Trophy race from St. Louis in that year. It was planned also to have balloonists furnish the Bureau with data acquired by them on ascents, using a convenient form prepared and furnished by the Bureau. At all times during the years of development of the airplane the Bureau has complied to the utmost extent with the scattering calls for advance information as to weather and wind conditions along the route to be followed in flight. But, no definite instructions have, until recently, been issued to stations with respect to the furnishing of meteorological data to pilots about to undertake long distance flights. The supplying of surface and upper air data and forecasts to Lt. W. D. Coney, Air Service, preceding his attempted trans-America flight is an example of what the Weather Bureau is called on to do for aviation. But as a matter of fact, it is believed the general flying personnel of this country are, in the main, unaware of the facilities which the Bureau has and of the availability of information of vital character to flying.

Weather reports will be a factor in the determination of insurance rates, and in the figuring of claims for damages. An insurance company would be loath to pay a claim resulting from an accident in the course of a flight made under adverse weather conditions. Where unfavorable weather occurs in the course of scheduled flights by transportation or mail companies, there would be another consideration involved, but the attitude of insurance companies on claims for damage in the face of Weather Bureau advices where non-postponement of the journey, or its continuances, is not of permanent importance will be no uncertain factor in the elimination of unnecessary risks.

It is of interest to know that officials of these Weather Bureau stations are frequently subpoened to appear to testify as to weather conditions, rainfall, wind, temperature, and so forth, in connection with claims for losses through negligence or otherwise on land and sea, arising from unpropitious weather and wind conditions. It is not unlikely that the near future will see Weather Bureau testimony of a deciding value in aircraft actions.

Stations are authorized to furnish available information forthwith, merely upon the receipt of telephonic or telegraphic requests. Cost of the messages, must of course, be paid by the applicant. Given the course over which a projected flight is to be made, the Bureau will arrange to furnish along the route all possible information as to fog, smoke, winds, visibility and the like, over the territory ahead.

Following is a list of the Weather Bureau Stations to which applications may be addressed.



THE LAIRD "SWALLOW", A POPULAR THREE-SEATER EXTENSIVELY USED IN THE MIDDLE-WEST

U. S. WEATHER BUREAU STATIONS

ATLANTIC COAST STATES AND ST. LAWRENCE VALLEY

Eastport Me.
Burlington, Vt.
Northfield, Vt.
Portland, Me.
Boston, Mass.*
Hartford, Conn.
New Haven, Conn.
Binghamton, N. Y.
Albany, N. Y.
Ithaca, N. Y.*
New York, N. Y.
Scranton, Pa.
Harrisburg, Pa.
Philadelphia, Pa.*
Reading, Pa.
Trenton, N. J.*
Baltimore, Md.*
Washington, D. C.
Norfolk, Va.
Richmond, Va.*
Wytheville, Va.
Charlotte, N. C.
Asheville, N. C.
Raleigh, N. C.*
Wilmington, N. C.
Charleston, S. C.
Columbia, S. C.*
Augusta, Ga.
Savannah, Ga.
Jacksonville, Fla.*
Miami, Fla.*
Key West, Fla.

GULF STATES

Atlanta, Ga.*
Macon, Ga. (Discontinued temp.)
Pensacola, Fla.
Mobile, Ala.
Montgomery, Ala.*
Birmingham, Ala.
Meridian, Miss.
Vicksburg, Miss.*
New Orleans, La.*
Shreveport, La.
Fort Smith, Ark.
Little Rock, Ark.*
Fort Worth, Tex.
Palestine, Tex.
Houston, Tex.*
Taylor, Tex.
Corpus Christi, Tex.

OHIO VALLEY AND TENNESSEE

Memphis, Tenn.
Nashville, Tenn.*
Chattanooga, Tenn.
Indianapolis, Ind.*
Cincinnati, Ohio.
Columbus, Ohio.*

* Climatological section center.

Knoxville, Tenn.
Terre Haute, Ind.
Evansville, Ind.
Dayton, O.
Parkersburg, W. Va.*
Pittsburgh, Pa.

LAKE REGION

Buffalo, N. Y.
Erie, Pa.
Cleveland, Ohio
Sandusky, Ohio
Toledo, Ohio
Detroit, Mich.
Saginaw, Mich.
Lansing, Mich.
Sault Ste. Marie, Mich.
Houghton, Mich.
Marquette, Mich.
Escanaba, Mich.
Port Huron, Mich.
Green Bay, Wis.
Grand Rapids, Mich.*
Fort Wayne, Ind.
Chicago, Ill.
Milwaukee, Wis.*
Duluth, Minn.

UPPER MISSISSIPPI VALLEY

Minneapolis, Minn.*
Madison, Wis.
La Crosse, Wis.
Charles City, Iowa
Dubuque, Iowa
Davenport, Iowa
Des Moines, Iowa*
Keokuk, Iowa
Peoria, Ill.
Springfield, Ill.*
St. Louis, Mo.
Cairo, Ill.

MISSOURI VALLEY

Springfield, Mo.
Kansas City. Mo.
Columbia, Mo.*
Hannibal, Mo.
Wichita, Kans.
Omaha, Nebr.
Sioux City, Iowa
Huron, S. Dak.*
Yankton, S. D.
Bismarck, N. Dak.*

ROCKY MOUNTAIN AND PLATEAU REGIONS

Helena, Mont.*
Lewiston, Idaho
Boise, Idaho*
Rapid City, S. Dak.
Sheridan, Wyo.
Lander, Wyo.
Salt Lake City, Utah*
Grand Junction, Colo.
Cheyenne, Wyo.*
North Platte, Nebr.
Lincoln, Nebr.*
Denver, Colo.*
Pueblo, Colo.
Oklahoma City, Okla.*
Amarillo, Tex.
Dallas, Tex.
Roswell, N. Mex.
Santa Fe, N. M.*
Phoenix, Ariz.*

PACIFIC SLOPE

Walla Walla, Wash.
Spokane, Wash.
Seattle, Wash.*
Portland, Oreg.*
Reno, Nev.*
Eureka, Cal.
Sacramento, Cal.
San Francisco, Cal.*
Fresno, Cal.
Los Angeles, Cal.

Following is a duplicate list, arranged, for other convenience, alphabetically by cities.

ALPHABETICAL LIST OF U. S. WEATHER BUREAU STATIONS

Albany, N. Y.
Amarillo, Tex.
Asheville, N. C.
Atlanta, Ga.*
Augusta, Ga.
Baltimore, Md.*
Binghamton, N. Y.
Birmingham, Ala.
Bismark, N. Dak.*
Boise, Idaho*
Boston, Mass.*
Buffalo, N. Y.
Burlington, Vt.
Cairo, Ill.
Charles City, Iowa
Charleston, S. C.
Charlotte, N. C.
Chattanooga, Tenn.
Cheyenne, Wyo.*
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbia, Mo.*
Macon, Ga. (Discontinued temporarily)
Madison, Wis.
Marquette, Mich.
Memphis, Tenn.
Meridian, Miss.
Miami, Fla.
Milwaukee, Wis.*
Minneapolis, Minn.*
Mobile, Ala.
Montgomery, Ala.*
Nashville, Tenn.*
New Haven, Conn.
New Orleans, La.*
New York, N. Y.
Norfolk, Va.
Northfield, Vt.
North Platte, Nebr.
Oklahoma City, Okla.*
Omaha, Nebr.
Palestine, Tex.
Parkersburg, W. Va.*
Pensacola, Fla.
Columbia, S. C.*
Columbus, Ohio*
Corpus Christi, Tex.
Dallas, Tex.
Davenport, Iowa
Dayton, Ohio
Denver, Colo.*
Des Moines, Iowa*
Detroit, Mich.
Dubuque, Iowa
Duluth, Minn.
Eastport, Me.
Erie, Pa.
Escanaba, Mich.
Eureka, Calif.
Evansville, Ind.
Fort Smith, Ark.
Fort Wayne, Ind.
Fort Worth, Tex.
Fresno, Calif.
Grand Junction, Colo.
Grand Rapids, Mich.*
Green Bay, Wis.
Hannibal, Mo.
Harrisburg, Pa.
Hartford, Conn.
Helena, Mont.*
Houghton, Mich.
Houston, Tex.*
Huron, S. Dak.*
Indianapolis, Ind.*
Ithaca, N. Y.*
Jacksonville, Fla.*
Kansas City, Mo.
Keokuk, Iowa
Key West, Fla.
Knoxville, Tenn.
La Crosse, Wis.
Lander, Wyo.
Lansing, Mich.
Lewiston, Idaho
Lincoln, Nebr.*
Little Rock, Ark.*
Los Angeles, Calif.
Peoria, Ill.
Philadelphia, Pa.*
Phoenix, Ariz.*
Pittsburgh, Pa.
Port Huron, Mich.
Portland, Me.
Portland, Ore.*
Pueblo, Colo.
Raleigh, N. C.*
Rapid City, S. Dak.
Reading, Pa.
Reno, Nev.*
Richmond, Va.*
Roswell, N. Mex.
Sacramento, Calif.
Saginaw, Mich.
St. Louis, Mo.
Salt. Lake City, Utah*
San Diego, Calif.
Sandusky, Ohio
San Francisco, Calif.*
Santa Fe, N. Mex.*
Sault Sainte Marie, Mich.
Savannah, Ga.
Scranton, Pa.
Seattle, Wash.*
Sheridan, Wyo.
Shreveport, La.
Sioux City, Iowa
Spokane, Wash.
Springfield, Ill.*
Springfield, Mo.
Taylor, Tex.
Terre Haute, Ind.
Toledo, Ohio
Trenton, N. J.*
Vicksburg, Miss.*
Walla Walla, Wash.
Washington, D. C.
Wichita, Kans.
Wilmington, N. C.
Wytheville, Va.
Yankton, S. Dak.

* Climatological section center.

Governmental Meteorological Service

To the Army and Navy there is available information from other stations than those of the Weather Bureau. The Navy has a number and the Signal Corps is expanding its meteorological project from the present twenty stations at as many military stations in the United States at which there are Air Service organizations.

On the experimental "airway" between New York and Washington a well developed system of information supply is already established and in operation. The aerodrome at Washington receives a report by radio of conditions at Mitchel Field, New York, and, in turn sends by Signal Corps radio the conditions of the upper air and surface observations at Bolling Field. The air traveller between these two cities has the following stations from which meteorological information can be obtained during the course of his flight: Washington (Navy Signal Corps and Weather Bureau), Aberdeen, Md. (Signal Corps), Baltimore, Md., (Weather Bureau), Philadelphia, Pa. (Signal Corps and Weather Bureau), New York (Weather Bureau), Mitchel Field (Signal Corps).

On the second Army airway, between Washington and Dayton, Ohio, there are stations as follows: Washington (Signal Corps, Navy and Weather Bureau), Moundsville, W. Va. (Signal Corps), Pittsburgh, Pa. (Weather Bureau), McCook Field, Ohio, (Signal Corps), and Dayton, Ohio, (Weather Bureau).

On a trip south along the Coast from New York, there are in addition to those listed on the New York-Washington route the Signal Corps stations at Camp Alfred Vail, N. J., Lakehurst, N. J., Edgewood, Md., Lee Hall, Va., Langley Field at Hampton, Va., Camp Bragg at Fayetteville, N. C., Camp Benning, Ga., and Arcadia, Fla., and all the stations of the Weather Bureau.

SIGNAL CORPS METEOROLOGICAL STATIONS AT FIELDS AND CAMPS

March Field	Riverside, Calif.
Ross Field	Arcadia, Calif.
Kelly Field	Kelly Field, Tex.
Ellington Field	Houston, Tex.
Post Field	Ft. Sill, Okla.
Camp Benning	Camp Benning, Ga.
Camp Bierne	Ft. Bliss, Tex.
Camp Bragg (Pope Field)	Fayetteville, N. C.
Langley Field	Hampton, Va.
Balloon School	Lee Hall, Va.
Bolling Field	Anacostia,, Washington, D. C.
Godman Field	Camp Knox, Ky.
McCook Field	Dayton, Ohio
Ft. Omaha	Omaha, Nebr.
Aberdeen Proving Grounds	Aberdeen, Md.
Mitchel Field	Long Island, N. Y. (Garden City)
Camp Lewis	Camp Lewis, Wash.
Camp Alfred Vail	Camp Alfred Vail, N. J.
Edgewood Arsenal	Edgewood, Md.
Lakehurst Proving Ground	Lakehurst, N. J.

PROSPECTED STATIONS

Mather Field	Mills, Calif.
Rockwell Field	Coronado, Calif.
Brooks Field	San Antonio, Tex.
Carlstrom Field	Arcadia, Fla.

New Chain of Landing Fields

Bob Hausler, manager of Anderson Field, Las Vegas, Nev., and director of landing fields in the state of Nevada for the Aero Club of Southern California, is organizing a chain of landing fields between Los Angeles and Salt Lake by way of Las Vegas. The following towns along this route have landing fields: In California—Victorville, Yermo, Kelso, Roach; in Nevada—Las Vegas, Dry Lake, Caliente; in Utah—Milford, Lynndyl, Salt Lake.

The new route will afford a short cut to the Pacific coast, especially to Los Angeles, and should prove popular with pilots owing to the fact that weather conditions are much better along this route than on the route the Air Mail Service follows from Salt Lake to San Francisco. Flying conditions are stated to be ideal, no snow being met with, in winter, after leaving Caliente, while emergency landings can be made every twenty-five or thirty miles.

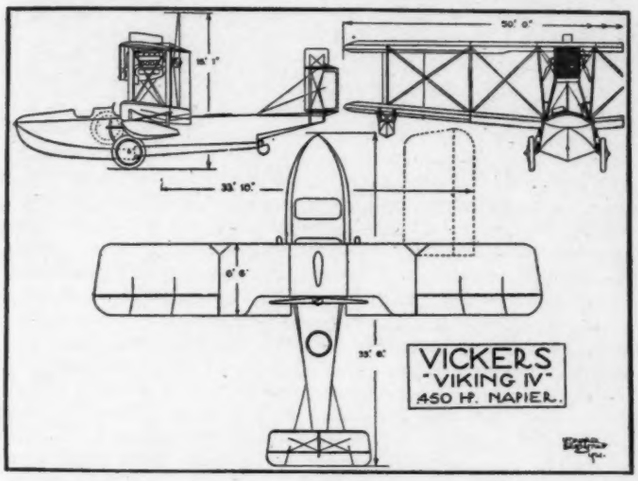
The Vickers Viking IV Amphibian

The Vickers Viking IV, here shown in outline drawings, is a development of the machine which last summer won the British Air Ministry competition for commercial amphibians. It differs from the latter mainly in that it is fitted with folding wings—which fold *forward*—and in that it has a larger wing surface and a better commercial performance. The beam of the hull has also been increased and the controls have been removed from the forward to the after cockpit.

The Viking III—which won the British amphibian competition—had a total weight of 4,900 lb., a useful load of 700 lb. and a maximum speed of 121 m.p.h. The climb to 6,000 ft. was accomplished in 5.2 min. and the range was 420 miles at 90 m.p.h. The Viking IV has a total weight of 5,600 lb., a useful load of 1,090 lb. and a maximum speed of 119 m.p.h. The machine climbs to 6,000 ft. in 7.35 min. and has a range of 480 miles at 90 m.p.h. A comparison of these figures shows that on the new type speed and climb have to some extent been sacrificed with a view to obtaining a larger useful load.

The hull is built of timber, planked with Consuta and fitted with two steps. Consuta is a special veneer manufactured by Saunders, Ltd., which consists of several layers of thin wood cemented and sewn together with thin copper wire. The retractable landing gear consists of two telescopic sprung struts, one at each side of the hull, pivoted at the upper end, and carrying landing wheels at the other end, which can be swung forward and upward about the top pivot by a pinion working in a rack forming a quadrant of a circle. The tail skid for land work is fitted at the rear step, and consists of an oleo-pneumatic operated steel shoe which also serves as a water rudder when the machine is afloat.

The wings are of biplane form, with a large dihedral on the lower wings alone and no stagger or sweepback. The upper wings are in five sections, namely:—the center section over the engine, an inner fixed section on each side and two outer folding sections. The lower wings are in four sections,



OUTLINE DRAWINGS OF THE VICKERS VIKING IV AMPHIBIAN

From *The Aeroplane*

there being no center section. Outside the center section struts there are two pairs of interplane struts per side. Folding occurs from the first of these strut pairs, the wings pivoting about the front spar. By folding the wings the span is reduced from 50 ft. to 33 ft. 10 in., while the overall length is but slightly increased, being 33 ft. 10 in. The machine thus saves a great amount of stowage space.

Normally seats for five are fitted, two passengers forward and one aft, with pilot and mechanic in the center cockpit. By removing the three passenger seats a stowage space of about 75 sq. ft. becomes available for merchandise, mails, etc.

The Vickers Viking IV can be fitted with either the 450 hp. Napier "Lion" or the 360 hp. Rolls-Royce "Eagle" engines. With the latter the speed and climb are somewhat reduced, but the pay load remains the same and there is no appreciable difference to the range and cruising speed.

Following are the specifications of the Vickers Viking IV:—

DIMENSIONS, WEIGHTS AND AREAS

Maximum span	50	ft.
Span, folded	33	ft. 10 in.
Overall length	33	ft. 6 in.
Length folded	33	ft. 10 in.
Overall height, on wheels	15	ft. 1 in.
Gap, at center line	7	ft. 7 in.
Chord	6	ft. 6 in.
Incidence of wings	6	deg.
Dihedral, bottom wings	5	deg.
Wing area	594	sq. ft.
Wing loading	9.4	lb./sq. ft.
Power loading	12.45	lb./hp.
Weight empty, with water	3,728	lb.
Gasoline	568	lb.
Oil	54	lb.
Pilot	160	lb.
Pay load	1,090	lb.
Weight loaded	5,600	lb.

PERFORMANCE

Engine	Napier "Lion"	Rolls "Eagle"
Full speed, sea level	119 m.p.h.	102 m.p.h.
Climb to 6,000 ft.	7.35 min.	15.8 min.
Full speed at 6,000 ft.	114.5 m.p.h.	96 m.p.h.
Full speed range at 6,000 ft.	350 miles	380 miles
Range at 90 m.p.h. at 6,000 ft.	480 miles	450 miles
Absolute ceiling	18,250 ft.	11,000 ft.
Landing speed	50 m.p.h.	50 m.p.h.

How U. S. Can Save $452,000,000

The Economy of Airplanes as compared to Battleships

By Lt. Col. H. E. Hartney

So many stories have appeared recently on the subject of the uses of airplanes and battleships for war prejudiced for one side or the other, with no accompanying well-balanced argument, that the public begins to recognize in some of them personal feelings rather than logical conclusions based on a real interest in national defense. The articles are unfair to either the battleship or the airplane, for the real end is lost sight of, and in most cases the debate involved resolves itself to a test between one battleship and one airplane.

To say that one can build one thousand airplanes for one battleship and that therefore we should build all airplanes is not logical. To state, however, that from a building program of ten battleships we would be well advised to cut one and with the saving invest in one thousand airplanes if we were to conscientiously look out after the interests of national defense is extremely logical, and, indeed, appears highly advisable at the present moment, as would appear from some of the following observations. It must be remembered that we are considering war instruments of national defense just as we would compare the rifle and machine gun, the 75 and 6 inch cannon, the stokes mortar or the hand grenade. It is not a question of "is one better than the other?", but a matter of just to what extent the inventory of war weapons for national defense should be balanced as to airplanes and as to battleships.

Factors of the Problem

In considering this there are a great many factors that must be taken into account; roughly these can be divided into technical or tactical, with priority in favor of the tactical, because, after all, the only reason for manufacturing instruments of war is to defeat the enemy in battle. One does not construct a battleship because it is magnificant in grandeur, marvelous in construction, and a very ingenious piece of human workmanship. It is built so that it can destroy enemy ships and harass enemy land fortifications or entrenchments. It "does its bit" in the making of a decision which marks victory or defeat for a nation in war, but no matter how small that part is, unless some other instrument can do the job better, the battleship must for all time be retained in service.

Under the heading of technical consideration we class such matters as cost and production, and under the tactical put mobility, speed, range of action, vulnerability, offensive and defensive power. Under the heading of cost, let us consider the comparative ratio of battleship and airplane in a national program of construction of war instruments. Suppose Congress, in view of the trend of the times, because of England's reduced naval program, because of Japan's policy, and because of the fact that science has given us an air force, a new body of aerial features that fights over land and sea, decides to curtail its battleship building program to the extent of ten battleships and its auxiliary cruisers and to put in its place an air force consisting of one thousands airplanes and two airplane carriers, the carriers to be supplied for such times as it may be necessary for this air force to operate over water. It will not be necessary to provide auxilliary ships for the airplane carriers, because it is taken for granted that they have speed above other ships of the fleet and can utilize the mosquito fleet of the battleships when occasion demands it.

It has been estimated that the initial cost of battleships plus one year's operating expenses, depreciation at the rate of 1.15 per year and salaries of all personnel, will be $585,000,000; on the other hand, the additional cost of an air force would be $132,000,000, salaries, depreciation and maintenance included in the air force as well. A thousand planes would consist of 600 pursuit, 200 bombing and attack planes, and 200 torpedo carrying planes; two carriers would cost $41,000,000 each, the same as the battleship, would possess tremendous speed, and we would be able to house the units made up of one thousand airplanes less the reserve, the carriers actually housing two groups of pursuit, 200 planes, and one group of bombers, attack and torpedo carriers, totalling 50 planes.

The saving in this investment to the nation would be roughly $452,000,000. This money could be apportioned instead of to the advocates of a naval program, to those delegates before Congress who seek appropriations for water power development in the State of Washington, on the Tennessee River, or for land reclamation projects on the Rio Grande. It is logical to presume that the nation will increase its revenue annually to the extent of six per cent; or the sum of about $27,000,000, and this money would pay for the yearly cost of the crews, maintenance and depreciation of the newly constituted air force and leave a payment of about $13,000,000 toward principal, or, in other words, would in approximately ten years pay off the initial cost of the air force. **Thus Congress, by listening to the advocates of money expenditures for economical industrial development and to meet other demands, cutting the naval program to the extent of ten battleships and auxiliary vessels and buying an air force, at the end of ten years has obtained an air force for nothing.** In addition to this, if some experts, such as General William Mitchell, of the Air Service, are correct, the United States' national defense forces will have been strengthened. For having kept abreast of the times they will have in their hand the new weapon of war, the airplane, commanded by an efficient body of air men equal to that of any other nation.

The Question of Production

Let us now consider another factor under the heading of technical, that is, the matter of producton. Standard airplanes can be produced in six month's time. Do not confuse this with the production of a new type of airplane. The development and production of a new type of airplane takes at least three years and sometimes longer; but an airplane of standard design, for which the nation possesses production drawings, can be turned out on a quantity basis at the end of six months. But not so with the big battleship, with its complicated mass of intricate machinery and its armament and armor. It takes at least three years before this ship is in commission after the keel is laid down. This gives a very decided advantage in favor of the airplane. From the standpoint of time, therefore, the airplane, on the production basis, the the great advantage. No mention has been made of the decided advantage this has because of constant perfection in each. A new type of battleship being invented cannot be in fight for three years, but a standard airplane can get into action after six months. The mobilization of the country's forces on the outbreak of the war, therefore, should include a heavy airplane building program.

As for mobility, it is riduculous to attempt a comparison between a light airplane and a cumbersome battleship in this respect. The airplanes, because of their mobility, are more difficult to down than a bird, because they fly at greater altitudes and because they fly so much faster than even the duck, which is reputed to be one of the fastest birds that flies. Because of their mobility they can operate with only two hours' notice to seek a decision over one hundred miles from the base. Battleships, on the other hand, with two hours' notice, cannot proceed more than ten or fifteen miles, not allowing anything for the time it takes to weigh anchor. The writer has seen 18 airplanes of the Nieuport-28 type, in France, leave the ground on an alert, and all be in the air in four minutes and fifty seconds after the alarm was sounded.

Not only can airplanes move about freely, but they move at terrific speed, as compared with the fastest battleship. A pursuit plane could, from twenty yards, attack a land forification and in ten minutes be out of range for distance, or in twenty minutes be out of range for altitude, and in the latter case still be directly over the target. A battleship, attacking

a land fortification from one-half mile (but do not let readers suppose for a minute that it would do so) could not be out of range under one hour and a half and then, unlike an airplane, would be forever removed from the scene of engagement.

This question involves the range of action. Advocates of a strong naval program state that the airplane is handicapped because it cannot proceed far from its base. This conclusion must not be arrived at too quickly. The very fact that a plane can do so much damage in such a short time makes the desirability of proceeding a long distance from a base unnecessary for airplanes. When a battle fleet of ships proceeds, for example, one thousand miles to sea, its base for all purposes is the flagship of that fleet, although it is temporarily removed from its land base. When airplanes operate one thousand miles out to sea their base is an airplane carrier removed one hundred miles or more from the actual scene of the engagement, so that after all consideration is given to the point the airplane has the advantage in this respect.

But consider the vulnerability of each. An airplane is less vulnerable than nature's air navigator, the bird, because it can be crashed seriously and repaired in a short time and with little expense made to fly again; while a bird once shot down seldom recovers. A battleship, on the other hand, is less favored than nature's strongest seafarer, the whale, because the whale once shot, can dive, while a battleship once its rudder or propellers are damaged, must remain out of action, and take the brunt of the enemy's salvos until she is sent to the bottom. The loss of the personnel on an airplane as compared to that on a battleship must not be forgotten. A thousand sailors and many officers go down with a big battleship, but only one officer and a couple of men are sacrificed with each plane. Surely you aim at a very vulnerable weapon of the national defense when you aim at a battleship, and, on the other hand, a very insignificant portion from the standpoint of material and personnel when you endeavor to destroy an airplane.

But either an airplane or battleship would be useless in war if it did not have offensive power, i. e., the capacity to destroy enemy forces, whether land, sea or air. Broadly speaking, and it is recognized that this is a debatable point, the airplane can hit at any one of the three forces of national defense, air, sea or land, but a battleship can only hit at two, land and sea. Nearly every pilot who fought overseas hold as *"nil"* the power of battleship and anti-aircraft gun to shoot down aircraft, and will claim that it is only an accident when an anti-aircraft shell hits an airplane. This in itself, therefore, gives the airplane three branches of offensive action as opposed to two of the battleship. Granted that the power of the land, the sea, and the air is about the same in national defense, from this standpoint alone of offensive action, the airplane forces should be increased out of all proportion to the battleship.

As for defensive power of each, it seems that the airplane has the great advantage. It can rely on its speed and maneuverability and never fire a gun and be very safe, unless it is outnumbered. A battleship relies almost entirely upon its guns or the weapons of its auxiliary vessels. Destroy its protective mosquito screen and it is virtually doomed. Destroy the protecting eschelons of an airplane and it at least has a fighting chance of getting to safety. Ask any airman who has ever participated in a "dog fight" over the line to read the story of the battle of Jutland and the description of the sinking battleship, some of them almost whitehot as they burned and settled, and then have him compare the defensive power of the airplane and the battleship, and speaking from the standpoint of personal safety he will invariably prefer to be in an airplane in the hottest aerial engagement than on a battleship in the mildest brush with the enemy.

There are other factors that should be taken into consideration, such as the utility of the airplane and battleship in peacetime, the capacity of putting them to dead storage in reserve, and other features vital to the taxpayer.

Space does not permit the enlargement of the different arguments that could be given from technical and tactical standpoints, but if other articles comparing these two great instruments of national defense in more detail are written on these lines, it is felt sure that the building of an air force, irrespective of the requirements of the army and navy, will be assured, for Congress and representative of public opinion will demand it.

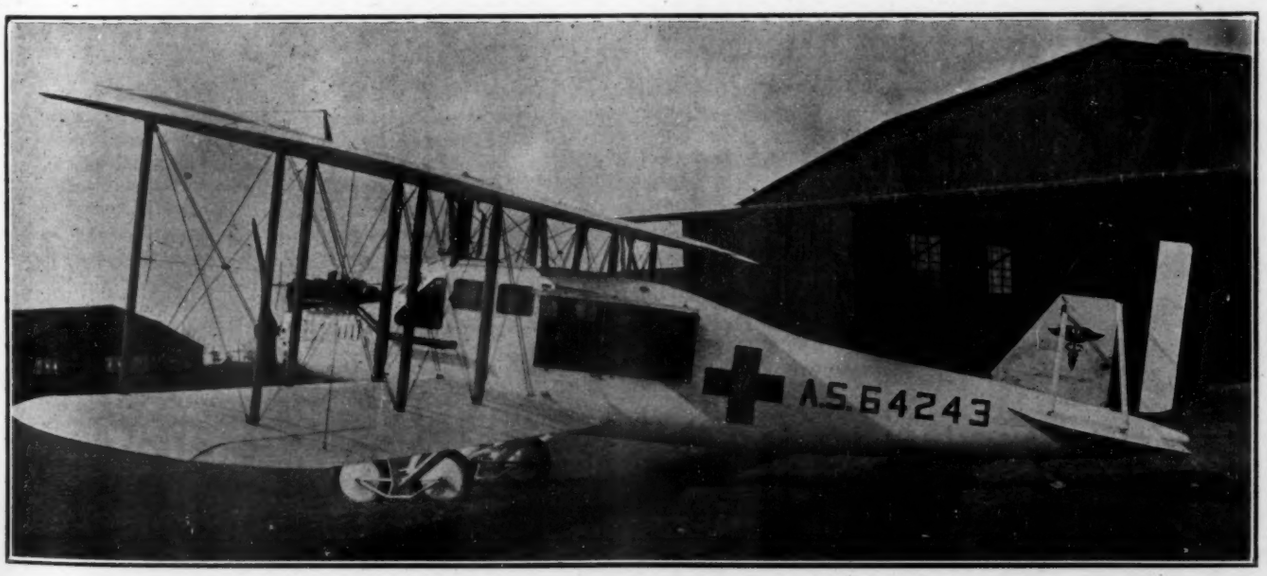
Fire at Wittemann Plant

An explosion of gasoline stored in a separate storage house at the plant of the Wittemann Aircraft Co., Hasbrouck Heights, N. J., April 27, caused a fire which destroyed the storage building and for a time endangered the main structure, a brick and steel factory constructed especially for aircraft work. Efforts of employees confined the fire to the original buildings. The loss is said to be $1000.

The Wittemann Co. is busy on Army, Navy and Post Office Department airplane work.

International Gordon Bennett Balloon Race

The possibility that contestants in the International Gordon Bennett Balloon Race to be held at Brussels Sept. 17, 1921, may be forced into Germany and into Russia, has made it necessary to take up diplomatic questions which may arise in order to secure the safety of the pilots and their balloons and to provide for their safe return from these countries.



CURTISS "EAGLE" CONVERTED INTO AN AMBULANCE FOR THE ARMY AIR SERVICE
Photo U. S. Army Air Service

British Air Power and Air Policy

Analysis of British Air Appropriations, 1921-1922

Prepared by Manufacturers Aircraft Association

Organization

The Royal Air Force of Great Britain is a distinct and separate establishment, under a Minister. Since 1919 it happens that the Rt. Hon. Winston Spencer Churchill held the portfolio of both War and Air, extreme dissatisfaction resulting therefrom. It was contended by the Navy that the Army was thus favored. It was contended by many in aeronautics, in Parliament and by a large body of the press, that this dual arrangement tended to expand strictly military service aeronautics at the expense of civil flying.

Within the last month Mr. Churchill relinquished the War portfolio for the Colonial, proposing, at the same time, to retain that of the Air. This, however, invited vigorous protest and the subject was debated in the House of Commons in March, when the Air Estimates for 1921-22 were presented. Appropriation estimates are regarded as final. Therefore the estimates in this instance are the figures granted. In the debate there was unanimity F O R the Royal Air Force. The only difference lay in criticism of what Churchill's political enemies regarded as bias in favor of strictly military establishments to the disadvantage of civil aviation. *This must be always borne in mind* in order to appreciate fully the following facts:

1. Great Britain has a Separate Air Department.
2. It is under the direction of a Minister who is a member of the Cabinet.
3. Great Britain has an *Air Policy.*
4. Great Britain has an aerial law and adequate machinery for enforcing it.

The Air Estimate debate resulted in victory for those critics who, conceding the wisdom of service aeronautics, nevertheless contended that greater attention should be given the development of the civil side of the art. They were successful, for Sir Frederick Guest, a man of political prestige if not of peculiar aeronautical experience, was made Secretary of State for Air. The British Air Ministry thus attains the independent status for which it was originally intended.

Appropriations

The Air Estimates for 1921-22 called for a total expenditure of £19,007,991, or approximately $95,000,000. at the normal rate of exchange. An establishment of 30,880 officers and men, exclusive of those serving in India was provided. Roughly, the appropriation includes the following major items:—

Pay	£4,899,000
Quartering, Stores (except Technical), Supplies and Transport	3,143,000
Technical and Warlike Stores (Aircraft and Engine Construction)	4,058,000
Works, Buildings, Lands	3,048,000
Air Ministry	916,000
Civil Aviation	898,000
Experimental and Research Services	1,835,000

The foregoing include certain small sums remaining from previous appropriations, which accounts for variance in totals.

Of the £4,058,000 for technical and warlike stores, it is provided that £1,681,000 shall be spent for aircraft and engines.

Of the £916,000 for the Air Ministry, £120,101 goes to the Department of the Controller General of Civil Aviation and to the Meteorological Office. *The Controller General of Civil Aviation draws £3,000 a year compensation. The incumbent is Major General Sir F. H. Sykes, one of the biggest men available for the job.*

Included in the Civil Aviation establishment is £74,640 for the great air ports, wireless stations, mooring masts, etc. at Croydon, Kidbrooke, Lympne and Fulham.

£102,000 is provided for the dissemination of weather reports. Meteorological stations are actually maintained at twenty-eight (28) points, within and without the British Isles.

The sum of £60,000 is included for Subsidies to British commercial aircraft operating companies.

Of the £1,835,000 for Experimental and Research Services, £69,000 goes for salaries and wages; £364,000 for the Royal Aircraft Establishment at Farnborough; and £140,000 for the Royal Airship Works at Cardington.

Following is in part Mr. Churchill's Address in Parliament on the Air Estimates:—

Mr. Churchill's Address

"* * * * * I pointed out two years ago that, quite apart from clearing away the gigantic debris and enormous mass of material which the War had left, and which had to be dispersed in one way or other, it would take, in my opinion, five years to make an efficient, self-respecting, well-disciplined, economically-organized Air Force. About eighteen months of these five years have now gone, and the progress has been very much greater than I had ventured to hope. It has been rendered possible solely by the fact that during the whole period we have had continuity of administration. There has been no chopping and changing either of men or of plant so far as the Royal Air Force is concerned. Everything is being carried out step by step as was intended, every superior officer or official is pursuing his work with a sense of being accountable, not for a week or for a month, but for the year after next, and possibly the year after that.

"* * * * * There are few people who have any idea of the complexity of the organization of an Air Force. There are, for instance, no less than fifty-four trades, of which thirty are highly-skilled trades, involved in the production and in the repair of an airplane. That gives an idea of the immense complexity from a technical point of view. Almost every known science and art practiced among men is involved in aeronautical research. The whole of this extraordinarily complicated material side of aviation, almost without compare in a technical organization, is now brought into contact with an entirely separate set of complications, namely, all those arising from the art of war, almost indefinite in their scope and variety, and all the interplay of war considerations upon this very complicated material constitute, in your ultimate product, the complex proposition of an efficient Royal Air Force. The Navy and Army can each specify a large number of separate and particular functions, each requiring a special type of machine, each requiring a specially trained pilot, which they demand to have fulfilled for them by the Royal Air Force.

"For instance, machines are required for the Navy to spot the fall of shot fired at vessels which are completely concealed below the horizon owing to their great distance. Large machines of an amphibious type are required to scout far over the seas and take the place to a considerable extent of the far more expensive cruisers. Large machines are also required to attack the heavy ships of the enemy in their harbors and at sea with torpedoes and bombs and thus compete with the torpedo boat destroyers which have bulked so largely in the past. Small machines of high fighting quality and maneuvering power are required to rise up from the decks of ships and afterward to alight upon them again, in order to attack the torpedo carrying, bomb carrying and reconnoitering machines with which you are bound to assume a modern hostile fleet will be equipped.

"With the Army the types are already well known. You have got to have machines to mark for the artillery, machines to reconnoiter for the infantry, machines to fight with the infantry, the armored machines which come very low down to fight, as they did in the last War, the machines which are to reconnoiter with the tanks, the machines which are to bomb

at short distances or at a great distance, the machines which are to fight the airplanes of the enemy of different types in the air, and so protect not only all your own airplanes but the regular services of the Army. Everyone of these various applications of air power require a special type of machine, and the special training of men, and if you are to have an Air Force which is an integral, effective, scientific, military unit, you cannot afford to be ignorant of any of these duties or incapable of performing them. It is difficult to make an officer, to train men for the responsibility and bearing which an officer requires. It is difficult to make a pilot, to secure that extraordinary facility in the conduct of the machine in the air; but in the Royal Air Force, when you have trained a man both to be an officer and to be a pilot, trained the same man to both these important functions even then you are not by any means at the end. The pilot, with all his skill in flying, with all his knowledge of his machine, would be a mere prey to an enemy unless he could, in addition, fulfil at least one of the highly specialized functions of aerial war-gunnery, bombing, torpedoing, photography, wireless telegraphy, spotting for artillery, observing, and other functions of that kind. Our organization must therefore provide for a large number of varied schools and training establishments, and this is what we have been steadily building up in different parts of the country, according to one scheme, in the last eighteen months.

R.A.F. Ground Establishments

"Now I will tell the House about some of these establishments, because it is necessary that they should realize the complexity of the Air Service, compared with the Army, or even with the Navy itself. At Halton we are going to train 3,000 boys to be skilled mechanics, with an eventual output of 1,000 a year, and here and at Manston adult recruits are now undergoing an intensive course of technical training. At Cranwell we are training cadets to be officers, and simultaneously a large number of the boy mechanics who are eventually to be accommodated at Halton. At Upavon we are teaching men to be instructors in flying, and officers are also given a course of practical engineering. At Netheravon and five other training schools, one of which will be in Egypt, we are training officers to become highly skilled pilots, not instructors, but pilots. At Andover a school will be opened to teach air pilotage and night flying. Eastchurch will be a station where armament, aerial gunnery, and bombing are taught. At Gosport they will learn torpedo dropping from aircraft, and experiments are being conducted to improve the methods of observation for naval guns, and the wireless control of surface craft, that is to say, of self-propelled vessels which move without any man on them through the sea and are directed in their movements by an airplane in the air with wireless. At Flowerdown there is an electrical and wireless school. I need scarcely say that each of the schools which I have mentioned is the head of an extremely elaborate, complicated, and mentally dominating study and art, which has its relation to the general purpose we have in hand. At Larkhill, kite-balloon training is undertaken. At Farnborough, photography in all its forms, that is to say, the taking of photographs, the reproduction of photographs rapidly, the understanding and reading of photographs, and the detection of the meaning of photographs taken from the air—a wonderful science in itself, which would, I am certain, fascinate any Member who had time to go and see even what its general scope is.

"At Uxbridge is the Air Force depot, and there we have a physical training school. At Salisbury and Farnborough artillery and infantry cooperation are taught to work with the airplanes of these two other Forces. At Calshott, air navigation over the sea, long-range flights by the stars or by other methods, and seaplane flying. At Felixstowe, and Leuchars, in Scotland, are stations where the cooperation of the Navy is carried on. Then there are the great experimental stations at Martlesham, Grain, and Biggam Hill. Then there is the Royal Aircraft Establishment at Farnborough, an institution most vital for the general development of flying. There is a research laboratory with schools for medical officers at Holly Hill, to enable them to study the medical problems which are peculiar to aviation. There are a whole set of medical problems peculiar to aviation, which comprise the effects on the human being of the different altitudes, and an infinite study of the kind of tests to which recruits and would-be pilots are subjected before you can be sure they will stand the particular strain to which they will be subjected without risking their lives and the lives of other dependents on them. Lastly, there are courses of general instruction which we have arranged at Cambridge, Oxford, London, Capetown and Sheffield in the great universities in these cities. These courses deal, firstly, with the theories underlying aviation, and secondly, they provide specialized engineering instruction.

"I have unfolded the whole of this picture to the House, because every part of this complicated organization is very largely interdependent. Like the organs of the human body, all are necessary for healthy life. I wonder how many of our critics have taken the trouble even to learn the exact articulation of the Air Service. Sometimes I think they are wise, because there is no doubt that the first effect of knowledge is to cramp the style. Our organization has now been carried to a point where its entire scope can be discerned. It is still very new; it still wants the rest of the five years to complete it; but, at any rate, it is all blocked in, and you can see in actual working the whole of this organization, and it constitutes what is, upon the whole, I venture to say, one of the most remarkable educational systems for imparting practical skill and scientific knowledge to young British lads of every rank and class in life which has ever been called into being in this country, or, as far as I know, in any other. Leaving war purposes out altogether, leaving the idea of war and the military application of the science out altogether, there can be no doubt that the enrichment and cultivation of national aptitude resulting from the educational and training establishments of the Royal Air Force are a great national asset, and an asset which, let me point out, is shared by all classes.

"This whole system, with all its complicated establishments, has just been laboriously brought into being and is just beginning to work as a whole, and, of course, it has just reached the point in its development where it would be possible to do it the greatest amount of harm in the shortest possible time. When one looks at it as one sees it now, one cannot help saying to one's self, what an irresistible temptation this must offer to ignorant destructiveness.

R.A.F. Has 32 Service Squadrons

"Upon the foundation which I have described if these training establishments are maintained the fighting squadrons upon which we are relying to keep peace and order throughout the Empire and to preserve for us the means of defence at home. Without a complete training organization you cannot have any efficient force of air squadrons; once you have got that organization it will carry a few more or a few less without any particular inconvenience or additional expense. There are 28 fully formed service squadrons, of which six are in Egypt and Palestine, five in Mesopotamia, eight in India, one on the Rhine, one at Malta, the last not yet fully equipped; thus 21 out of the 28 squadrons are overseas. The equivalent of three more squadrons are in Ireland, three are working with the Navy, while one is employed at home in giving refresher courses to pilots. The four additional squadrons which are the residue of the five sanctioned by the House a few months ago, will begin forming on 1st April, and that brings our total up to 32. These additional squadrons are wanted in many directions. They constitute the only reserve for all contingencies that we possess in the flying service. These fighting squadrons and training establishments comprise 2,900 officers, about 25,000 men, with a certain number of civil assistants. That is the Air Force upon which, rightly or wrongly we have been laboring for the last two years.

"I think there is a possibility in the future of a higher degree of economy being achieved through our being able to make squadrons undertake more the work of the training establishments. But we have not yet been able to do that because firstly, the squadrons have themselves been forming, and, secondly, because all these squadrons have been engaged in actual fighting, or in operations which have many of the unpleasant elements of actual fighting, during the currency of the last twelve months. In addition, we propose this year to begin the formation on a very small scale of a Territorial

Air Force, for which £20,000 is take in the Estimates. Our idea is to have six squadrons stationed near centers where there is a large engineering population, and where aerodromes are available. Each squadron would have a small nucleus of regular air mechanics, and it is hoped that the skilled voluntary element in the neighborhood will form this small nucleus.

"* * * * I am very anxious to illustrate to them how foolish and wasteful it would be if we were to take advice which is pressed upon us from more than one quarter at present. It is said, for instance, 'Is not the war over, was not the last war the war to end all war—and has it not ended by leaving such a feeling toward one another among all the nations of the world, among all individuals of every class in every part of the world that all idea of violence is entirely removed from human affairs? Has it not put an end to all international rivalry, has it not led to general disarmament? Has not our Empire become so quiet and tranquil in every part that we really could afford to rely solely upon moral suasion?' and so on. It is also said, 'What do we want all this service aviation for? Instead of this let us go in for some splendid new development of civil aviation. Let us take seven or eight millions from the Royal Air Force and devote them to the pursuits of running airships and airplanes all over the country and all over the world.' I do not say for a moment that those are not good objects in themselves if only we had the money for them, but when it comes to cutting in upon necessities in order to provide what, after all, at their best are conveniences, surely we should be committing a very great folly.

Fostering Civilian Aviation

"* * * * The task of fostering civilian aviation in the British Isles will be attended with much difficulty. The fogs and mists and other climatic conditions are a terrible hindrance. Moreover, the country is covered by a network of railways and roads, which constitute a most formidable competition with the air. Travelling by air does not mean travelling from one city to another, but from one aerodrome to another; the aerodromes are on the outsides of the cities and it usually takes from fifteen to thirty minutes to reach or return from an aerodrome. Then you have to compete in an aeroplane with trains which carry passengers into the heart of the cities, and with motor cars which take them actually from door to door. If you add to that the danger and uncertainty induced by climatic conditions, it will be seen that we are much less favorably circumstanced, so far as domestic civil aviation is concerned, than countries like Frantce, Italy, Spain or, I dare say, the United States of America. Therefore, I should not expect to see a very large or a very rapid development of domestic civil aviation within these islands. I think the Government might easily pour out very large sums of money with that object, without achieving any permanent result. There is however, one route which we should keep open, and which certainly offers superior prospects of success. I mean the air route from London to Paris and the Continent generally. Here the British airplane, although still hampered by the weather conditions of these islands, has the enormous boon, the almost inestimable boon to bestow on a traveller, of eliminating the crossing of the Channel with its attendant delays and discomforts.

"The Chancellor of the Exchequer has accorded to the Air Ministry a very wide discretionary power in the spending of the £1,000,000 allocated to civil aviation, provided that the total is not exceeded and that no commitment is made which involves future increases on the £1,000,000. The sum of £60,000 is included in the Estimates for subsidies to civil aerial transport firms, and this was based on a scheme proposed by Lord Weir's Committee for subsidizing such companies to the extent of 25 per cent of their gross earnings. Now, however, that the French Government have decided to grant to their companies assistance on a most generous scale, I fear that if we adhere to the scheme of Lord Weir's Committee our firms will be so heavily undercut that there will be no encouragement for British lines to continue. I propose, therefore, to set up immediately a Committee, including members of the aircraft industry and the aerial transport firms, to devise the necessary alternative methods which will meet these changed conditions, and to make proposals for immediate action. If a saving can be effected on other parts of the civil aviation Vote, the inducements we now offer will be made much greater. More than that I cannot say at present.

"I am bound to deal with at least one further question. We are often asked, Is the Air Force to be simply an addition to the pre-War Army; is it an extra burden on the taxpayers of every country, or will it gradually become a substitute for an important portion both of the Army and the Fleet? There is no doubt that, properly handled and developed, the Air Force will become a substitute to a very important extent both for soldiers and ships. It may not, however, become a substitute first of all until it is formed and perfect, and it cannot become a substitute except in so far as it proves by practical steps that it is able to discharge the function which has hitherto been and is now being discharged from day to day by the Army and the Navy. So far as the Army is concerned, we are convinced that the Air Force has it in its power at the present time very sensibly to reduce the numbers and costs of the garrisons of certain Oriental territories for which we are at present responsible. We know that in the recent rebellion in Mesopotamia whole districts were prevented from rebellion by the mere fact that airplanes were seen cruising over those areas. So far as coast defence is concerned the defence of naval ports and defence against invasion—there is no doubt that the Air Force can afford a real protection that will take the place of far more costly vessels necessary in the pre-War days. So far as the Navy is concerned, it is quite true that no sensible or well-informed person contemplates the Air Force being able in the next five or ten years to take the place of capital ships that have formed the British line of battle on sea. Harm is done when claims are made on behalf of the Air Force either in regard to maintaining order and security, unaided, alone, single-handed, in large disturbed countries or in regard to the prime defence of these islands and of our Empire on the sea. The Air Force can only at the present time act as a supplement, as an increasing supplement, but still only as a suppleemnt to the Army and the Navy, but it should be a supplement which, from now onward, should enable the number of types of warships to be reduced and considerable reductions to be effected in the number of troops we have hitherto employed in certain parts of the world. It may well be, for instance, that the capital ship will be increasingly watched and protected by aircraft in the future instead of by the larger number of small vessels, cruisers, destroyers, trawlers which have been found indispensable to its safety in the late War. It may well be that reconnaisance at sea by aircraft may be found a substitute for far more expensive types of sea-going ships. It may well be—this, perhaps, will be thought an extraordinary suggestion—that the submarine will find in the airplane another of those deadly menaces which threaten to curtail its sinister intrusion into the foundations of our naval security. I do not wish to prejudge matters. Obviously, these questions of air and of naval air material are at present very largely in flux, but I am sure of this, and this is the point and the only point which I have been endeavoring to put before the House during the whole of the observations they have permitted me to address to them—this is the sole point to which all my arguments from whichever quarter they have originated, have been directed—I am sure that to scrap and break up the Air Force which has been created laboriously, which has just reached the effective stage, would not only rob you of an essential and vital means of defence, but will also cut you off from the possibilities of future reductions in the other services through the substitution of air power for sea power, which reductions may indeed be an essential part of our future security.

"So long as I am responsible for the Air Ministry, the policy, which I now submit to the House will continue in essentials, if the House supports me, to be what it has been during the last two years, that is to say, it will be first of all to spend £1,000,000 a year on civil aviation in whatever manner may be found best, but with particular regard to the importance of maintaining the Cross-Channel Services. Secondly, to build up in all its details a properly combined, efficient fighting service, a healthy, skilled, and well-disciplined body of officers and men; and, thirdly, to maintain a unified, separate, independent Air Force as a third and equal arm in the Service with the Army and the Navy, and to act continu-

ously in close and harmonious cooperation and combination with them."

Sir W. Joynson-Hicks said: I wonder if the House realizes how much more effective our service would be if we had an efficient torpedo-carrying airplane at the present time. Nobody disputes the enormous power in naval warfare of the torpedo whether in attacking big ships or little ships. It is possible to have today torpedo-carrying airplanes flying at a height of over 10,000 feet, shutting off their engine so as to make no noise, and then gliding down at a speed of 140 miles per hour. They can carry a torpedo weighing 1,500 lbs., with 1,000 lbs. of T.N.T. All these details have been published in a technical paper so I am not giving any information away to possible enemies. I do not think that anybody yet realizes the enormous possibilities of these airplanes. They would be absolutely invisible until within two or three minutes of the vessel to be attacked, whereas a destroyer is visible 10 or 12 minutes away. Then by means of an airplane letting out a smoke-screen the unfortunate battleship can be surrounded, all the while knowing that there may be four or five or even ten of these hideous wasps about to attack it, travelling at a rate of 140 miles per hour, very difficult to hit even if they can be seen. After having discharged one of these great torpedoes, it can escape being hit by twisting and turning. No battleship could possibly cope with them under such circumstances.

Possibilities of the Torpedoplane

"That is as far as we have gone at the present time but I see no reason to doubt that within another ten years we shall have airplanes carrying torpedoes weighing 3,000 lbs. Engines are being made today capable of lifting a torpedo-carrying airplane of that size. There is indeed very little limit in the possibilities of attacks by torpedo-carrying airplanes on battleships of the line. I realize, of course, that our Navy will make efforts, as in the past, to counteract all that. But just note for a moment the difference between the money we spend today on 100 destroyers and that which would have to be spent on these airplanes. There were, I believe, about 100 destroyers at the Battle of Jutland. A destroyer costs £150,000. A torpedo-carrying machine costs from £5,000 to £7,000, and one could have almost as many torpedo-carrying airplanes as he liked. In lieu of the 100 destroyers we had at Jutland, we might have several thousand torpedo-carrying airplanes. What would have been the fate of the German fleet when trying to get away from Jutland if instead of being followed and attacked by our destroyers they had been attacked by 6,000 or 7,000 torpedo-carrying airplanes? Assume, even for a moment, that one-half of the airplanes were shot down. I venture to say that the remaining airplanes, flying at the rate of 140 miles an hour would have made short work of the German Fleet. Of course there would have to be ships to carry the airplanes, but we know there are magnificent vessels in His Majetsy's Navy with great level decks from which airplanes could get off and to which they could return, and it is quite possible that there will be ships in the future capable of carrying from 50 to 100 of these airplanes. Pictures have been published showing the enormous decks from which these airplanes will go off. But I might give an illustration showing how these torpedo-carrying airplanes could be used without any necessity for having carrying ships. We had several raids on the East Coast by ships of the German Navy during the War. We know that many of these raiders got away practically unharmed after having bombarded women and children in our coast towns. It would be possible to give these ships a two and a half hours' start and then send a squadron or two of these swift flying torpedo-carrying airplanes which could overtake them in an hour and a half. The distance would be well within their radius and having discharged their torpedoes they could get safely back again. All this would be well within their limits of petrol supply.

"I think I am right in saying that practically every pre-Armistice machine is now obsolete, or if it is not so today it certainly will be by the end of this year. That at any rate is the view of most of our experts, and it is distinctly the view of the American Air Service.

"Two years ago an International Traffic Association was formed at the Hague, and the chair was taken by General Sir Sefton Brancker, one of our foremost flying officers. Last month that Association met in Berlin, and the chair was taken by a German. The English companies are out of it altogether. Norway, Sweden, Denmark and Holland are willing to come in with Great Britain, to link up their civil aviation with ours, and to take their machines from our manufacturers. The whole of that is lost and gone, and before very long—probably this year—Fokker, whose machines we used to know something about during the War, and who has since devoted his genius to the commercial side, will be running a line from Amsterdam to London, and, in all probability on to Liverpool. The first thought that comes to one's mind is that we will not allow him to do it, but I am afraid we must. Situated, as we are, on an island, it is essential to us that we should retain the freedom of the air over foreign countries. It is no use our saying to any foreign country, 'You may not run a service over England' because the natural reply would be, 'Very well, you keep to your own island; you shall not run an English service across our country.' It is vital to our future in the air that we should retain by agreement with foreign countries the right of running air services across them.

"During the War we said over and over again that the essential of an Air Service is that you should keep your factories in existence. You cannot institute factories by the wave of a magician's wand. You cannot get back the designers and staff necessary for making airplanes or air engines. You must keep your factories going. Ours have almost disappeared. Mr. Holt Thomas's is practically gone. Shorts, who made naval machines, are now making omnibuses, and have practically stopped doing air work. SOPWITHS WERE BROKEN UP SOME FEW MONTHS AGO, AND EIGHT OF THEIR BEST MEN, INCLUDING THE CHIEF DESIGNER AND THE ASSISTANT AND WORKS MANAGER HAVE BEEN TAKEN OVER BY JAPAN. THEY HAVE GONE THERE, AND ARE WORKING FOR THE JAPANESE GOVERNMENT, WHICH, I MAY SAY, IS SPENDING FAR MORE MONEY ON AVIATION THAN WE ARE."

Personnel of The Royal Air Force

1. *AIR COUNCIL*

President of the Air Council—The Rt. Hon. Winston Spencer Churchill, M. P., Secretary of State for Air.

Vice-President of the Air Council—The Rt. Hon. the Marquess of Londonderry, Under Secretary of State for Air.

Members—Air-Marshal Sir. H. M. Trenchard, Chief of the Air Staff; Major-General Sir F. H. Sykes, Controller-General of Civil Aviation; Air Vice-Marshal Sir E. L. Ellington, Director-General of Supply and Research. F. Nicholson, Esq., Secretary of the Air Ministry, Sir James Stevenson, Rear-Admiral Sir C. F. Lambert.

2. *AIR MINISTRY*

Secretary of State for Air—The Rt. Hon. W. S. Churchill, M. P.; Under Secretary of State for Air, The Rt. Hon. the Marquess of Londonderry, Secretary of the Air Ministry, W. F. Nicholson, Esq. C. B.

Finance Department:
Assistant Financial Secretary.
Director of Finance for Personnel.
Director of Finance for Material.
Director of Contracts.

Directorate of Lands (Joint Service for War Office, Ministry of Munitions, and Air Ministry).
Director General of Lands.
Controller of Lands.
Chief Valuer and Compensation Officer.

Department of the Chief of the Air Staff:
Chief of the Air Staff: Air Marshal Sir H. M. Trenchard.
Civil Assistant.
Private Secretary.
Director of Operations and Intelligence.
Director of Training and Organization.
Deputy Director of Training.
Director of Personnel.
Deputy Director.
Director of Equipment. Deputy Director of Equipment.

Deputy Director of Stores. Director of Medical Services.
Director of Works and Buildings. Deputy Director.

Department of the Director General of Supply and Research: Director General of Supply and Research: Air Vice Marshal Sir E. L. Ellington. Private Secretary.
Director of Research.
Deputy Director of Design.
Deputy Director of Airships Research.
Deputy Director of Armament.
Deputy Director of Instruments. Director Aircraft Supplies.
Director of Aeronautical Inspection.

Department of the Controller General of Civil Aviation:
Controller-General: Major-General Sir F. H. Sykes.
Private Secretary. Controller of Information.
Controller of Communications.
Controller of Aerodromes and Licensing.
Director of Meteorological Office.

3. *AIR COMMANDS*

1. *United Kingdom.*

(a) *Inland Area*: The inland Area comprises all units in Great Britain, with the exception of those units comprising the Coastal Area and the Cranwell and Halton Commands.

(b) *Coastal Area*: The Coastal Area comprises Stations, etc., as follows: Calshot, Lee-on-Solent, Gosport, Isle of Grain, Cattewater, North Queensferry, Donibristle, Leuchars, Smoogroo, Felixstowe. Also all Aircraft Carriers and Units afloat in Fighting Ships in Home Waters, and all Airship Stations.

(c) *No. 11 (Irish Wing)*. This Command comprises all units in Ireland. For operations these units are controlled by the General Officer Commanding, Irish Command.

(d) *Cranwell.* The Air Officer Commanding, Royal Air Force, Cranwell is Commandant of the R.A.F. (Cadet) College and commands all units at Cranwell

(e) *Halton.* The Air Officer Commanding, Royal Air Force, Halton, is Commandant of No. 1, School of Technical Training (Boys) and commands all units at Halton.

2. *Overseas.*

(a) *Middle East Area*: Headquarters—Cairo.

(b) *R.A.F. India*: Headquarters—Ambala.

(c) *Mediterranean Group*: Headquarters—Valetta, Malta. This Command comprises all units in the Mediterranean Sea Area cooperating with the Navy.

(d) *R.A.F. With the Army of the Rhine*: No. 12 Squadron. Biekendorf.

Reversible Steel Propeller Successful

The most noteworthy advance in steel propeller development of recent date has been made by the Standard Steel Propeller Co., of Pittsburgh, Pa. This company, working under contract with the Government, has delivered to the Air Service, Engineering Division, an all metal steel propeller capable of having the blades reversed.

The blades are made of steel tubing of tapering section and thickness without welding, except to close the extreme tip. The blades fit over the two arms of the hub, being held in place by means of rollers and ball bearings. These rollers greatly reduce the friction of rotating the blades about the center axis. By means of a control which extends to the cockpit, an angular movement of 45 deg. can be obtained with little exertion. The cockpit control consists of a lever for quick reverse, in combination with the hand wheel for final adjustment in straight-away level flying.

The propeller was given a rigid test on the rest rig and later was installed in an airplane in which it was given several flight tests.

The idea of making a reversible propeller of steel was suggested to the Standard Steel Propeller Co. by the Engineering Division. The design of the blades was made by the Engineering Division at McCook Field, but all mechanical details were worked out by the Standard Steel Propeller Co. Credit for the development and manufacture of this propeller is chiefly due to Thomas A. Dicks, who formerly manufactured the Dicks-Luttress Steel Propeller, and is now with the Standard Steel Propeller Co.

A Letter

Editor, AVIATION AND AIRCRAFT JOURNAL:—

It seems most important to bring to your attention an article written by H. L. Scaife, entitled "What Was the Matter with the Air Service?", which appears in the April number of *Current History*. Mr. Scaife, who states he was formerly an officer in the Air Service, begins his article with the following subtitle, printed in italics: "The astonishing story, drawn wholly from official records, of one of the most colossal failures in human history—How the United States spent upward of a billion dollars for aircraft production without producing a single fighting plane on the battlefront".

AVIATION AND AIRCRAFT JOURNAL in its recent numbers has shown that instead of a billion dollars having been spent for aircraft production, only $113,000,000 was spent for airplanes in this country and about $20,000,000 abroad. However, setting the figures aside, let us examine this article further. Mr. Scaife heads one of his paragraphs—"The truth in a sentence"—and then goes on in italics—"The simple fact is that no American-made fighting plane reached the battlefront". Continuing, he then ingenuously states that the American-made DeHaviland 4s, of which there were 1443 in France on the day of the Armistice, including several hundred at the Front, were not fighting planes but observation planes.

Leaving out these American-made D.H.4s, does Mr. Scaife consider that the other planes which we had at the Front were entirely foreign? Does he realize that nearly all of them were made from raw materials furnished to France and England by our Government? That the instruments on these planes were of American manufacture? That the machine guns mounted on these planes were American? That the radio and photographic equipment was also American?

Having been Adjutant of Orly Field, the Acceptance Park where these planes were received from the French and the English, during the greater part of its existence, and having seen most of these planes with my own eyes, I not only feel that I am qualified but also that it is my duty to expose such misleading statements as those made by Mr. Scaife.

During March 31, 1918, to December 10, 1918, when deliveries to the Front ceased, we received at Orly a total of 3434 planes, of which 3141 were flown to the Front or to the flying schools which we had established in France. Of this amount, the following types were delivered to the zone of the advance: 856 Spad XIIIs, 418 Sopwith 1½-strutters, 126 Sopwith Camels, 572 Salmsons, 175 Breguets, 391 Nieuports and 30 S.E.5As.

The 30 S.E.5's were flown to Orly from England by our own ferry pilots who had been sent there for that purpose. These machines were made principally of American raw material and I well remember the day in October, 1918, when they landed at Orly, chiefly because the pilots lost no time in drawing our attention to the name plate on their Hispano-Suiza motors, which showed that these engines had been manufactured by the Wright-Martin Aircraft Corp. of New Brunswick, New Jersey, *U. S. A.* In view of the fact that when these planes got to the Front, which they did just before the Armistice, they had an American-made motor, were built of American raw material, and were equipped with American armament and instruments, they could hardly come under the category of foreign planes.

And as for the Spads, Camels, Nieuports, etc., let us bear in mind the following facts: They were largely built of American raw material. Their fabrication was under the inspection of U. S. Air Service officers. They were received at a U. S. Air Service field, where they were overhauled and equipped with American instruments and armament and flight tested by American pilots. They were delivered to the Front by American ferry pilots; and, lastly, they were purchased with American money. It is my contention that we are justified in considering these planes as much American as foreign, and that the public has been grossly misled by sensational articles containing half-truths, quarter-truths and untruths as to the real facts in the case.

ALBERT PALMER LOENING

Airplane Crashes--Engine Troubles*

By Stanwood W. Sparrow

Automotive Power Plant Section, Bureau of Standards

When the daily paper tells that a plane has crashed and states a definite cause such as the fracture of a fuel line or the collapse of a wing, public confidence in the safety of aviation is shaken. It is easy to believe, however, that defects so glaringly revealed will be corrected at once. The real blow to aviation comes when no satisfactory explanation for the accident is forthcoming. Knowledge of what is wrong must precede any intelligent effort to make a thing right. A wrecked plane bearing mute testimony to the existence of a fault and a confession of ignorance as to the nature of the fault tends to contradict assertions that aviation has outgrown the experimental stage. To bring attention to one possible cause of such unexplained accidents this note has been prepared for the National Advisory Committee for Aeronautics.

The Influence of Snow Formation

In testing airplane engines at the Bureau of Standards it has happened frequently that the engine performance became erratic when the temperature of the air entering the carburator was between 0 deg. C. (32 deg. F.) and 20 deg. C. (68 deg. F.). Investigation revealed the trouble to have been caused by the formation and collection of snow somewhere between the entrance to the carburetor and the manifold, probably at the throttle. Experiments in the carburetor test plant had shown the possibility of this trouble. In fact, a glass portion of the induction system made it possible for one actually to see the snow as it collected.

Proof scarcely less convincing was obtained during engine tests. That something was wrong became apparent from a drop in power. The manifold depression, the difference between atmospheric pressure and the pressure in the manifold, was greater than that usually obtained at full throttle at this speed. At the same time, measurements showed the rate of air flow to be lower than usual. Inasmuch as both of these effects would be produced by throttling the engine, they gave a clue to the source of trouble. In some cases the snow would continue to collect until it shut the engine down, while at other times, after it had effected a decrease in power of from 25 to 50 per cent, a portion would become dislodged and the engine would speed up. The test apparatus is arranged so that the air on its way to the engine passes over heating grids. If, while the power was still low, sufficient heat was applied to increase the air temperature 20 deg. C. (36 deg. F.) the power, manifold depression and air flow would soon regain their normal values. A few rather violent fluctuations of speed usually accompanied this period and can be attributed to the water passing into the combustion chamber as the snow melted.

Removal of Moisture Is Effective Cure

Granting this trouble to be caused by the condensation of moisture from the air and the subsequent formation of snow, the removal of the moisture should prove as effective a cure as an increase in temperature. Fortunately it was possible to do this and thus check the validity of this supposition as to the origin of the trouble. The engine test apparatus includes refrigerating coils which enable all the air taken by the engine to be cooled to below -20 deg. C. (-4 deg. F.). This air is then reheated to the desired temperature. Air when cooled to -20 deg. C. (-4 deg. F.) contains almost no moisture and no opportunity is offered for it to collect any during its passage from the heating grids to the engine. Under these conditions, the engine operated satisfactorily at those temperatures at which difficulty was experienced with the air from which the moisture had not been removed.

The more serious the manifestations of this trouble, the more difficult it becomes to secure accurate data for record. Fluctuations of speed are violent and a stalled engine is usually the final result. A record of a few instances where it was possible to hold the speed reasonably constant are given as examples of the trouble in its milder stages. On Feb. 14, 1921, with the engine operating at part throttle at 1800 r.p.m. it was noted that the power was decreasing. At 1:06 p. m. readings of carburetor air temperature and manifold depression showed the former to be 10 deg. C. (50 deg. F.) and the latter 25.0 cm. (9.84 in.) of mercury. Heat was applied and at 1:08 p. m. the air temperature had risen to 38 deg. C. (100 deg. F.) and the manifold depression had dropped to 6.8 cm. (2.68 in.). Again the temperature of the air was allowed to drop and again a drop in power and increase in manifold depression resulted. With the speed maintained at 1800 r.p.m., the throttle was opened wide and readings taken showing the air temperature to be 10 deg. C. (50 deg F.), the manifold depression 11.1 cm. (4.37 in.) and the brake horse power 86. Within two minutes, the application of heat had resulted in dropping the manifold depression to 5.6 cm. (2.20 in.) and in raising the brake horsepower to 185. The foregoing results were all obtained at air densities corresponding to ground level. Similar conditions were found on Feb. 23, at an air density corresponding to an altitude of 5,000 ft., with the engine operating at full throttle at 1600 r.p.m. With the air at a temperature of 30 deg. C. (86 deg. F.), the manifold depression was 2.9 cm. (1.14 in.) and the brake horse power was 156. Eight minutes after the heating was discontinued, the air temperature had become 8 deg. C. (46 deg. F.), the manifold depression 5.1 cm. (2.01 in.) and the brake horse power 120.

Changes in Mixture Ratio

While in all of these instances it was a change in weight of charge that caused the drop in power, the magnitude of the decrease may have been influenced by another factor, a change in mixture ratio. If a carburetor does not maintain the air-fuel ratio constant at reduced loads, any unintentional throttling involves a departure from the desired mixture quality as well as a reduction in mixture quantity. To the reader familiar with carburetors in which changes in the area of a small passage between the float chamber and throat effect the mixture ratio changes, still another source of danger has doubtless suggested itself. This danger is that a collection of snow may block the connecting passage and cause a serious change in air-fuel ratio.

Discussion thus far may have emphasized unduly loss of power instead of what is probably the more serious effect, excessive fluctuations in power. Under these conditions a pilot is in exactly the same position as though his engine were controlled by a lunatic, opening and closing the throttle at will. Yet, in case of an accident, before an examination could be made the snow would have melted leaving no evidence to confirm the pilot's report of trouble.

Need of External Heating

It is hardly worth while to attempt to predict from theoretical considerations at what temperature the trouble from snow formation will be most pronounced. It does seem desirable, however, to consider how much additional external heating is necessary to give reasonable assurance that the trouble will not occur. The weight of water vapor that a unit volume of air can contain decreases with decrease in temperature and the surplus condenses. Obviously if the drop in temperature be prevented there can be no condensation. The problem is to supply sufficient heat to completely vaporize the fuel so that no heat for this purpose need be withdrawn from the mixture. If the heat of vaporization of aviation gasoline be 75 cal. per gram (135 B.t.u. per lb.)† complete vaporization will produce a drop in mixture temperature of 26 deg. C. (47 deg. F.) with an air-fuel ratio of 10 to 1 and a drop of about 14 deg. C. (25 deg. F.) with an air-fuel ratio of 20 to 1. It is safe to assume that the mixture ratio used will fall within these limits. The above calculation

* N. A. C. A. Technical Note

† Ricardo, Automobile Engineer, Feb. 1921.

assumes all the fuel vaporized and all the heat used in vaporizing the fuel to be supplied by the mixture, while usually a portion of this heat is supplied externally. From these considerations it appears that the addition of an amount of heat sufficient to increase the mixture temperature 25 deg. C. (45 deg. F.) should prove a reasonable guarantee of immunity from this trouble. The power loss that this would entail should not exceed 5 per cent.

This note is not intended as a sweeping recommendation of additional air heating for every airplane engine. Such a course would be akin to prescribing medicine for a patient without first being assured that he was really sick. The aim is to call attention to a "disease" to which aviation engines are subject, to describe its symptoms, and to emphasize its seriousness. Methods of prevention or cure can be consigned with safety to those vitally concerned.

Book Reviews

DYNAMICS OF THE AEROPLANE. By Rene Devillers. Translated by Wm. John Walker (E. & F. N. Spon, London; 302 pp. 119 diagrams).

This book is written in a style which is peculiar to French writers on aerodynamics. It is not too profound, though certain portions of the subject are dealt with at excessive length. Some theorems are developed merely for the love of the mathematics involved, without having any great practical value. But, on the other hand, it is extremely clear and correct in treatment. It brings together a large number of dynamical problems which are scattered through magazines, developed in lecture notes, simply known to engineers without having received publication, or developed in early French books such as those of See. Certain new problems are skillfully developed and have considerable interest. For a student the book would make excellent reading. The designer would certainly like to have the book at his disposal, to refresh his memory on certain theoretical aspects of the subject.

The chapter on horizontal rectilinear flight contains some theorems which may be new to many American readers, and others which they will value for their clear authoratative statemen. Useful graphical methods are demonstrated for finding minimum power angle and certain geometrical rules are given. The treatment of the air screw is elementary and of no great value. The chapter in rectilinear gliding flight is interesting and presents some theorems. In dealing with climbing flight, M. Devillers again reduces the subject to some concise and instructive statements.

In dealing with flight performances as affected by altitude, M. Devillers presents material which is familiar, since it has been presented in a number of papers. But the subject certainly has not been treated as adequately in any book. A summary of the laws of flight at different altitudes but with the same angle of attack is of real value in its correct and concise presentation. The relationships between ceiling and weight per horse-power, loading per square foot, and finess ratios are well developed. The theory of flight with a supercharged engine is adequately treated.

M. Devillers develops the elementary theory of horizontal circular flight. While little is given in this chapter which is not well known already, it is useful to have the various theorems and deductions assembled in one book. Spiral gliding flight is treated perhaps more fully than ever before.

That wind velocity always increases fuel consumption on a journey to and back from a given point, and that for a given return journey, and a given consumption, the total consumption is a minimum when the wind velocity is normal to the route, are two interesting facts in a consideration of air transportation. In considering radius of action for bombing machine, an apparently sound analysis leads to the interesting deduction that economy in fuel and oil consumption due to the release of the bombs is proportional to the consumption on the outward journey and to the ratio of the weight of the bombs to the total initial weight of the machine.

The lengthy chapter on stability, in distinction to the rest of the book is open to the severest criticism. For instance, the author states that all machines which are stable in rectilinear descent remain stable when flying under power, whereas due to slip stream effects and the position of the center of thrust a machine may be stable in one condition and unstable in another. In dealing with reactions on the tail plane, the author uses such a doubtful formula as Joessel's. Dynamical stability is poorly treated. In general stability has been far more soundly treated in British and American treatises.

The theory of altitude correction of the carburetor is well developed.

MATERIALS OF CONSTRUCTION USED IN AIRCRAFT ENGINES. By Lt. Col. C. F. Jenkins, Professor of Engineering Science in the University of Oxford. (Government Stationary Office, London.)

Lt. Col. Jenkin formerly had charge of materials testing at the Aircraft Production Department of the British Ministry of Munitions, and hence should be expected to be a considerable authority on this subject. In fact, the report—which is in reality the size of a book—is a regular mine of useful information.

According to the preface, it is written with the object of placing on record for the use of aeronautical engineers the results and conclusions derived from the research work which has been carried out during the war on materials of construction of aircraft. The paramount importance of weight in aircraft construction has led to the development of various new materials, and has made it worth while to investigate many problems in the theory of the strength of materials which had not previously been of importance. No attempt has been made to compile a complete record of all the investigations which have been made; the object aimed at has been to state the conclusions arrived at and to describe the more important researches on which the conclusions are based. Most of the investigations were made with the object of solving urgent practical problems, and obtaining data on which design might be based, and the results are given as far as possible in a form in which they may be made immediate use of by engineers. Many interesting points of less urgency have arisen which have had to be left unsettled, and many of the investigations are not yet completed; suggestions for further research are made in most sections of the report.

A continuous series of researches were carried out during the whole of the war on timber and the aluminum alloys, but the other subjects were dealt with as occasion arose, and as a consequence the report has a disconnected and scrappy form, which is accentuated by the differences of style between the different sections, many of which are verbatim reprints of the original confidential memorandum issued during the war. It has not been considered necessary to fill in the blanks with matter which is well known, or to re-write the whole as a connected book on materials; the report is intended rather to serve as an addendum to the existing text books.

Several sections of the report deal with breakages and failures of parts. Much has been learnt from the study of these, and many of the investigations were originated in order to find the explanation of obscure failures. The complete contents is as follows: Preface, Mechanical Tests, Local Concentration of Stress, Steel, Steel Tubes, Stream-line Wires, Wire Ropes, Aluminum Alloys, Copper and Tin Alloys, Corrosion, Timber, Glue, Rubber Shock Absorber Cord, Fabric.

As is inevitable in a compilation of this magnitude, where much of the material has to be abstracted from other sources, it should be read with an intelligent perspective based on standard sources of fundamental knowledge. For example, in the very good chapter of Aluminum Alloys, we find the following statement: "Corrugated aluminum alloy covering for wings has been used in Germany, but there appears to be no prospect of success in that direction." In general, however, the statements are not so dogmatic.

The Washington-St. Thomas Flight

Bronzed by strong winds and a tropic sun, the Marine Corps fliers of the Washington-St. Thomas test flight landed at Bolling Field at 10:35 a. m. on April 22, on the last leg of their long trip. The fliers were accompanied by Major Roy S. Geiger, Lieutenant Frank H. Fleer, and Lieutenant Ford O. Rogers, each piloting a DH-4B airplane. The fliers were greeted at Bolling Field by Major General Commandant Lejeune, of the Marine Corps, and Capt. W. A. Moffett, U. S. N., Director of Naval Aviation, and their Aides.

Maj. T. C. Turner, Chief of Marine Corps Aviation, in command of the two planes that made the long flight, reports that flying from Washington to St. Thomas is an easy matter

CAPTAIN MOFFETT GREETING THE RETURNING MARINE AVIATORS: (LEFT TO RIGHT) MAJOR TURNER, LIEUT. BRADLEY, SERGEANT RUCKER AND LIEUT. SANDERSON

for DH-4B airplanes equipped with Liberty motors. The worst features of the trip are to be encountered along the Atlantic Coast, there being few landing fields between Key West and Fayetteville. "Flying over the western part of Cuba", says Major Turner, "is just like flying over Texas. The sugar plantations afford landing fields in all directions".

The worst single feature of the flight was the trip across the Windward Passage, where the fliers experienced baffling, heavy gusts of wind, which made difficult work for the pilots.

"The equipment was fine", said Major Turner. "It couldn't be better. We did all of our own overhauling and inspection enroute. We had one ticklish time at Camaguey, Cuba. There was no landing field near the city and we were obliged to come down in the Plaza. The whole Plaza was covered with telegraph poles piled along in rows and we were obliged to land in between them, which was a test of our skill and of the landing gear on the planes. We escaped without damage, but is was very close work".

The total distance covered was 4,842 miles, while the total elapsed time was 24 days. During 17 days of this time flying was maintained, and the actual flying-time for the total distance was 46 hours and 17 minutes. The distance from Daytona to Washington is 840 miles, yet the planes were able to cover this distance in six hours and 59 minutes. The flying time from Santo Domingo City to Washington was 22 hours and six minutes.

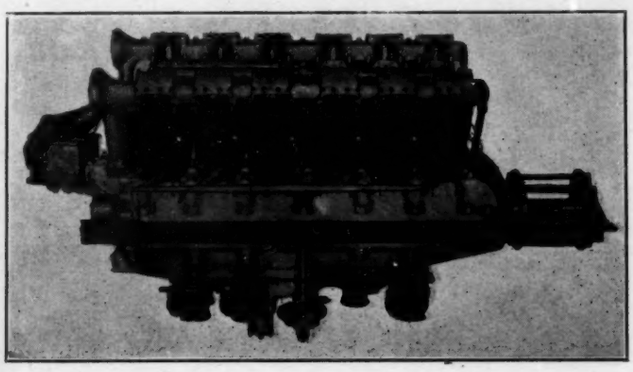
The personnel on this record-breaking flight, in addition to Major Turner, were 1st Lieut. Basil G. Bradley, second pilot in Major Turner's machine; 2nd Lieut. Lawson H. Sanderson, pilot of plane No. 2; and Gunnery Sergeant Charles W. Rucker, who flew in plane No. 2, and was engineer for the flight.

Major Turner stated that it was a great disappointment to himself and companions not to be able to make St. Thomas, but because of the quarantine at Porto Rico, due to the presence of the bubonic plague, the planes did not go beyond Santo Domingo City, D. R.

Tests of 700 Hp. Model W Engine

The Power Plant Section of the Air Service, Engineering Division at Dayton, Ohio, is engaged in preliminary tests of a 700 Hp. Model W aircraft engine. This engine was designed entirely by the Power Plant Section and was assembled in the McCook Field shops.

The engine is designed to develop 700 hp. at 1700 r.p.m., and is of the water-cooled W type, having 18 cylinders arranged in three rows of six, the angle between cylinder banks being 40 deg., giving included angle between outer banks of 80 deg. The cylinders are 5½ in. bore by 6½ in. stroke, having four valves per cylinder and provided with welded steel water jackets. As great reliability was one of the fundamental points in the design, provisions have been made for use of four independent magneto systems; although where it is desired to reduce the weight, one or two magnetos may be omitted.



MODEL W 700 HP. ENGINE DESIGNED BY THE ENGINEERING DIVISION, AIR SERVICE

Throughout the design every effort was made to secure a strong, reliable construction at a moderate value of horsepower per unit weight. The weight of the completed engine is 1720 lb. when equipped with four magnetos. This weight includes all ignition devices, carburetors, propellor hub, flange and bolts, but does not include any water nor oil.

The tests so far conducted prove conclusively that the engine may be relied upon to deliver the rated horse power in service, as the power obtained on the dynamometer showed a considerable margin in excess of the required 700 hp. Tests are progressing satisfactorily and a surprisingly small amount of trouble has developed so far. As soon as the preliminary power determinations are completed the engine will be put on the 50-hr. test to study its endurance.

Lloyd's Aviation Record

Apart from the register of machines recently issued by the British Air Ministry, Lloyd's have compiled a most comprehensive record of all aircraft licensed for commercial purposes. The particulars are obtained from the Air Ministry and from the owners, and every care is taken to keep the register up to date. The following details are given of all machines licensed:—Owner, address, etc.; maker's number and identification mark; country of origin; type; date when completed; passenger accommodation; date first flown; endurance with full load; weight per sq. ft. fully loaded; weight of cargo, including passengers; total weight fully loaded; minimum landing speed fully loaded; description and number of certificates; dates of issue, expiry and renewal of airworthiness certificate; engines; maker; engine cylinders, b.hp., cooling, ignition and gearing; type of tanks; nature of service since built; source of information and date; any deviation from standard type; construction; accidents.

The pilot's register has been built up in a similar way and gives name, address, etc.; age; date of birth; nationality; description and dates of certificates and licenses; types licensed to fly; general experience and hours flown per type; source of information; accidents; date of last medical examination; date of last flight and type of aircraft.

Municipal Air Port at Hartford, Conn.

Hartford, Conn., has taken a most progressive stand upon air traffic matters. It has an active municipal body known as the Hartford Aviation Commission which, with the Hartford Aero Club and the recently appointed aviation committee of the Connecticut Chamber of Commerce, are actively engaged in making the city and state prominent in aeronautics.

The Hartford Aviation Commission by acquiring jurisdiction over 96 acres of municipal property within a mile and a quarter of the center of the city on the west bank of the Connecticut River has established a municipal air port for land and water machines. The L-shaped field is of satisfactory proportions for present-day machines and, since all the adjacent property is open and fairly level, it affords an excellent opportunity for the development which the city has been planning for the past three months. All trees along the river bank have been razed on or near the field and grading operations have been started. A work shop building and oil and gas house have already been erected. It is anticipated that the field with markers, oil and gas, telephone connection and a dock for seaplanes will be ready by the middle of May.

On Nov. 22, 1920 the Board of Alderman of Hartford passed a resolution that the Mayor be "authorized to appoint a commission to be known as the Hartford Aviation Commission to be composed of five citizens to hold office from the 1st day of December, 1920 until the 1st day of April 1922. The Mayor shall be ex-officio of this Commission." The Commission held its first meeting on Dec. 15, 1920. Its members are Hiram Percy Maxim, President, Newton C. Brainard, Mayor, Member ex-officio; Samuel A. Miner, Treasurer, 294 Pearl St.; James B. Slimmon, Secretary, 61 Elizabeth Street, Harrison B. Freeman and Clarence M. Knox. All members of this commission have been interested in flying for several years, the activities of President Maxim and Mr. Miner commencing in 1904 with glider experiments, and that of the other members in actual flying experience in recent years.

The promotion of interstate aviation has been undertaken by the Connecticut Chamber of Commerce by the appointment of an aviation committee of which Judge William J. Malone of Bristol is chairman. Other members are Hiram Percy Maxim of Hartford, Lieut. W. Parker Seeley and Lieut. W. G. Raycroft of Bridgeport, and Henry C. Chappell of New London. Another member from New Haven will be named later. The purpose of this committee is to secure cooperation among the municipalities of Connecticut in the establishment of landing fields at proper points in connection with the New York to Boston air route. One of the first activities of the Chamber of Commerce aviation committee has been favorable consideration of a project to establish a flying boat passenger line between Springfield and New London with Hartford and Middletown as way stations, and which would bring the terminal cities within one hour's distance of one another. A trial flight on this route took place on Apr. 15 from the Hartford Yacht Club, when an Aeromarine-Navy HS-2L flying boat was despatched from New York with Judge Wm. J. Malone as a passenger.

German Air Traffic Development

The German air transport companies are making good use of the sad state of railroad and other transportation systems in the countries of their new Eastern neighbors.

A German company recently opened a regular service with Fokker passenger and freight planes between Danzig, Kovno and Vilna and between Danzig and Warsaw. The first two of these Dutch planes arrived by air from the Fokker factory recently, one stop being made enroute, at Warnemunde; each machine carries 1200 lbs. of freight so the service should prove a useful connection for passengers and urgent supplies between the centers of Lithuania and Poland and the Baltic ports.

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INDEX TO ADVERTISERS

A

Aero Limited, Inc..... 584
Aircraft Service Directory..... 614
Air Service Post (American Legion)..... 611

B

Bethlehem Aircraft Corp..... 611
Brewster-Goldsmith Corp..... 612

C

Curtiss Aeroplane & Motor Corp..... 583

D

Dayton Wright Co..... 582
Diggins, Ralph C., Co..... 612

E

Edstrom Machinery Co..... 611
Elias, G. & Bro., Inc..... 613

F

Ferdinand, L. W. & Co..... 612

H

Huff, Daland & Co., Inc..... 615

L

Laird, E. M., Co..... 610
Levy, James, Aircraft Co..... 612

M

Martin, The Glenn L., Co..... 616

R

R. T. Sales Co..... 612

S

Sperry, Lawrence, Aircraft Co., Inc..... 611

T

Thomas-Morse Aircraft Corp..... 585
Topper, Max, & Rosenthal..... 612

V

Valentine & Co..... 609

W

Wellington Sears & Co..... 612
Western Airline Co..... 612
Where to Fly..... 608
Wright Aeronautical Corp..... 586

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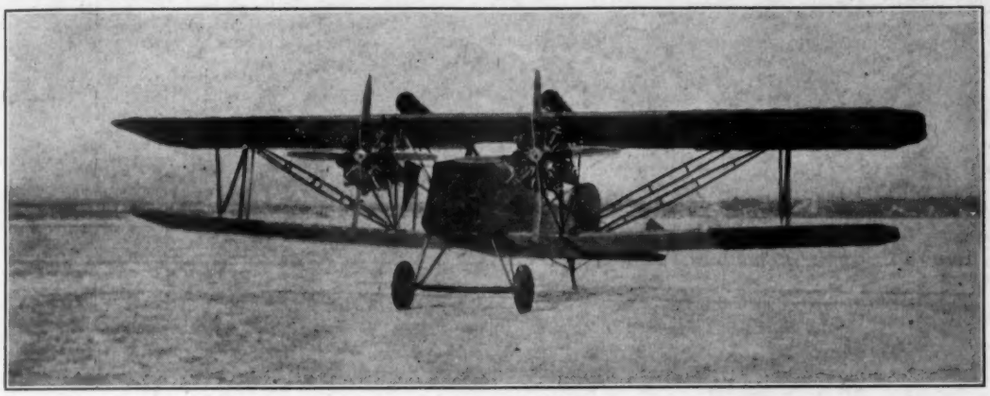

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